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December 15, 1981

Space Transportation System

Cargo Projects

Inertial Upper Stage/ Spacecraft Integration Plan

Volume I
Management Plan

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LIST OF ABBREVIATIONS AND ACRONYMS

The following abbreviations and acronyms are used in this document. Additional listings of Shuttle and Cargo acronyms and abbreviations are contained in GP-1052 and NASA Reference Publication 1059.

AF	Air Force
AFD	Aft Flight Deck
AFSCF	Air Force Satellite Control Facility
ASC	Aerospace Corporation
ASE	Airborne Support Equipment
ASTG	Aerospace Test Group
BAC	Boeing Aerospace Company
BAC/A	Boeing Aerospace Company - USAF FSD Contract
BAC/N	Boeing Aerospace Company - NASA KSC Contract
CCAFS	Cape Canaveral Air Force Station
CCMS	Checkout Control and Monitoring Subsystem
CDRL	Contract Data Requirements List
CDS	Central Data Subsystem
CI	Configuration Inspection
CITE	Cargo Integration Test Equipment
CO	Cargo Operations
CO/CIO	Cargo Integration Office
C/O	Checkout
COS	Checkout Station (IUS)
CP	Cargo Projects
CP-DPO	Cargo Projects Deployable Payload Office
CRR	Cargo Readiness Review
CS-MVD	Multi-Mission/Vertical Payloads Division
CV	Deployable Payload Operations Directorate
DEV	OMI Deviation
DOD	Department of Defense
DOP	Detailed Operating Procedure
DRN	Document Revision Notice
EED	Electro-Explosive Device
EGSE	Electronic Ground Support Equipment
ELS	Eastern Launch Site
ER	Explanation Report
ESMC	Eastern Space & Missile Center (Patrick AFB)
ET	External Tank
FAC	Facility
FEDP	Facility and Equipment Design Plan
FSD	Full Scale Development Program-IUS

LIST OF ABBREVIATIONS AND ACRONYMS

GMIL	Spaceflight Tracking & Data Network Station, KSC
GOAL	Ground Operations Aerospace Language
GOWG	Ground Operations Working Group
GPS	Ground Power System
GPTE	General Purpose Test Equipment
GSE	Ground Support Equipment
ICIO	Interim Cargo Integration Operations Contractor
ICD	Interface Control Drawing
IRN	Interface Revision Notice
IRS	Integrated Records System
ITL	Integrate-Transfer-Launch
IUS	Inertial Upper Stage
JSC	Johnson Space Center
KSC	Kennedy Space Center
LC-39	Launch Complex 39
LCC	Launch Control Center
LPS	Launch Processing System
LRU	Line Replaceable Unit
LSSM	Launch Site Support Manager, NASA/KSC
LSSP	Launch Site Support Plan
MDTSCO	McDonnell Douglas Technical Services Company
MCCH	Mission Control Center Houston
MMSE	Multi-Mission Support Equipment
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
N/A	Not applicable
OD	Operations Directive
OI	Operational Instrumentation, Orbiter Integrator
OIR	Open Item Review
OIS	Operational Intercommunication System
O&M	Operations & Maintenance
OMD	Operations & Maintenance Documentation
OMI	Operations & Maintenance Instruction
OMP	Operations Management Plan
OMR/P	Operations & Maintenance Requirements/Plan
OMRS	Operations & Maintenance Requirements & Specifications
OPF	Orbiter Processing Facility
OR	Operations Requirement

LIST OF ABBREVIATIONS AND ACRONYMS

PGHM	Payload Ground Handling Mechanism
PID	Program Introduction Document
PIRN	Preliminary Interface Revision Notice
PIP	Payload Integration Plan
P/L	Payload, Prelaunch
POCC	Payload Operations Control Center
POP	Preflight Operations Procedure
PR	Problem Report
PRACA	Problem Reporting & Corrective Action System
PRD	Program Requirements Document
PSP	Program Support Plan
QA(O)	Quality Assurance Office
R&I	Receiving & Inspection
RF	Radio Frequency
RI	Rockwell International Corporation
RSS	Rotating Service Structure
S&A	Safe and Arm
S/C	Spacecraft
SCF	Satellite Control Facility
SD	Space Division (USAF)
SDP	Software Development Plan
SE	Support Equipment
SF	KSC Safety Office
SGLS	Satellite-Ground Link System
SMAB	Solid Motor Assembly Building
SPO	System Program Office (USAF)
SR & QA	Safety, Reliability and Quality Assurance
STDN	Spaceflight Tracking Data Network
STE	Special Test Equipment
STS	Space Transportation System
TBA	To Be Added
TBD	To Be Determined
TBR	To Be Released/Resolved
TC	Test Conductor
TCS	Test Completion Sheet
TDRS(S)	Tracking Data Relay Satellite (System)
T&H	Transportation & Handling
TLM/TM	Telemetry
TOPS	Transistorized Operational Phone System
TP	Test Procedure
TPS	Test Preparation Sheet
TS	Technical Support
TT&C	Telemetry, Tracking and Command

LIST OF ABBREVIATIONS AND ACRONYMS

UDS	Universal Documentation System
USAF	United States Air Force
USBI	United Space Booster International
VIB	Vertical Integration Building - CCAFS
VPF	Vertical Processing Facility - KSC
VPHD	Vertical Payload Handling Device
WAD	Work Authorization Document
WSGT	White Sands Ground Terminal
YV	STS Launch Organization (USAF)

SECTION I

1.0 INTRODUCTION

This document consists of two volumes. This volume (Volume 1) is the management plan for the Inertial Upper Stage - Spacecraft (IUS-S/C) operations at the Kennedy Space Center (KSC). Volume 2 is the detailed plan for the Inertial Upper Stage Tracking & Data Relay Satellite (IUS/TDRS-A) integrated processing at KSC.

1.1 PURPOSE

The purpose of this volume is to describe the KSC management system for IUS-S/C processing from KSC arrival through launch. Cooperation in the various roles and responsibilities of the agencies/test team organizations involved, will assure safe, efficient processing of the IUS-S/C at KSC.

Unique S/C owner/user or developer/operator management roles and responsibilities that differ from those reflected here will be provided in an addendum to this document.

1.2 SCOPE

This volume encompasses a description of the roles and responsibilities of the agencies/test team organizations involved in IUS-S/C processing at KSC for non-Department of Defense (DOD) missions. It defines working relationships with respect to documentation preparation, coordination and approval, schedule development and maintenance, test conduct and control, configuration management, quality control and safety. The policy regarding the use of S/C contractor Test Procedures (TP's), IUS contractor Detailed Operating Procedures (DOP's) and KSC Operations & Maintenance Instructions (OMI's) is defined. Review and approval requirements for each documentation system are described.

1.3 AUTHORITY

The authority for this document is derived from two NASA Level 1 documents, NMI 8020.22A, NASA Interim Upper Stage (IUS) Project and NMI 8040.3, STS Operations Program Management.

1.4 REVISION

This document is under the release and revision control of the IUS-S/C integration contractor. It will be periodically updated as necessary to remain useful to its users. Concurrence by the signatories affected constitutes final approval of all changes.

1.5 REFERENCES

a. KMI 1710.1C Occupational Safety and Health Act.
b. KMI 1710.13B Safety Review of KSC Technical Operating Procedures.
c. KMI 5310.11B KSC Problem Reporting and Corrective Action System.
d. KMI 8660.2B KSC Requirements and Response Documentation System.
e. KHB 3410.1B Implementing Instructions for KSC Systems, Safety and Skills Training for Certification of Personnel.
f. KHB 8610.1B Support Services Handbook.
g. KHB 8610.4A OMI Handbook.
h. K-STSM-12.8 Operations and Maintenance Document Plan.
i. K-STSM-12.8.2 STS Cargo Launch Commit Criteria Handbook.

j. K-DPM-11.1 Launch Site Support Plan.

k. KPD 8040.14 Plan for Upper Stages Configuration Management.

l. JSC 14019 Payload Integration Plan.

m. PRD 20,000 Launch and Landing Program Requirments Document, Annexes E & G.

n. TR-76-04 SAMTEC DET.# 1, Range Instrumentation Handbook.

o. D290-10351-1 IUS-S/C Command and Telemetry List.

p. D290-500C0-1 ELS/IUS Operations Record Systems.

SECTION II

2.0 ROLES AND RESPONSIBILITIES

The roles and responsibilities outlined in the following paragraphs are those applicable to the processing of the IUS-S/C at KSC and do not include all responsibilities, intercenter agreements with other NASA centers or interagency (NASA to Air Force) agreements. The interfaces and responsibilities of these organizations with each other and with KSC are detailed in other documentation. The major thrust of this document is to address the responsibilities of the organizational entities participating in scheduling or document preparation/approval for IUS-S/C processing at KSC, including those with Hands on Hardware responsibilities.

2.1 NASA/KSC

NASA/KSC is responsible for overall Space Transportation System (STS) and Cargo operations at KSC, including safety and support. KSC is also responsible for the identification, design and implementation of facilities and equipment at KSC. The major tasks performed by NASA/KSC which will support the IUS-S/C program are:

a. Identification of KSC site capabilities.

b. Identification of KSC required processing requirements.

c. Review, concur and implement IUS and S/C requirements at KSC for facilities. equipment, test operations and test support.

d. Planning for the implementation and conduct of the checkout of IUS-S/C interfaces, overall processing flow and integrated STS operations.

e. Scheduling of IUS-S/C and STS operations from arrival through launch, including coordination with external agencies/organizations for payload schedules prior to KSC arrival to assure meeting launch schedules.

f. Assign facility utilization to accommodate user and STS requirements.

g. Identification and coordination of NASA/KSC control systems, e.g., safety, quality assurance, procedure development and tracking.

h. Provide guidance and advice to involved agencies on design requirements, checkout operations and launch processing to assure compliance with KSC and Johnson Space Center (JSC) STS operations requirements.

To perform these tasks, KSC responsibilities are satisfied by the Cargo Projects Office, Cargo Operations Directorate and Shuttle Operations Directorate. For activities involving the IUS and the associated NASA spacecraft in KSC facilities, these offices are responsible for IUS-to-Spacecraft Integration Processing and Cargo-to-Shuttle Vehicle Integration.

2.1.1 CARGO PROJECTS OFFICE. The Cargo Projects Office is responsible for facilities and Ground Support Equipment, milestone schedules and funding to meet requirements. Within the Cargo Projects Office, the Deployable Payload Office, CP-DPO, is responsible for project management planning and integration associated with deployable payload projects, including integration of IUS and its associated non-DOD Spacecraft.

The Cargo Projects Office will:

a. Provide a Launch Site Support Manager (LSSM).

b. Monitor the preparation of the Launch Site Support Plan (LSSP). Ensure the response to requirements is correct and identify the Optional services requirements to the spacecraft owner/operator.

c. Oversee the identification and accumulation of support requirements and insure responses to these requirements are provided.

d. Co-chair the IUS Ground Operations Working Group with the 6555th Aerospace Test Group (ASTG).

e. Chair the IUS-S/C Ground Operations Working Group for Non-DOD Missions.

f. Through the above Ground Operations Working Groups, establish project milestones, coordinate interrelated activities, impose action items to resolve problems and surface potential problems that require outside resolution.

g. Chair the Cargo Readiness Review (CRR).

Boeing Aerospace Company-NASA (BAC-N) and McDonnell Douglas Technical Services Company (MDTSCO) are on contract to support CP-DPO.

2.1.2 CARGO OPERATIONS (CO). Within the Cargo Operations Directorate, the Cargo Integration Office, Multi-Mission Vertical Payload Division and Automated Payload Division have been delegated to manage and implement the cargo processing schedules and develop and manage ground operations plans. They establish Cargo/Ground Support Equipment (GSE) facility readiness on a per mission basis, integrate upper stage vehicles with payloads (IUS-S/C) and integrate cargo elements i to STS cargo; validate interfaces between cargo elements, between cargo and Cargo Integration Test Equipment (CITE) and Rotating Service Structure (RSS); and perform cargo processing in the VPF.

a. Cargo Operations Directorate will:

(1) Form and chair a cargo off-line test team for each IUS-S/C mission.

(2) Participate as members of the IUS Ground Operations Working Group and of the IUS-S/C Ground Operations Working Group.

(3) Integrate and coordinate schedules for the flow and processing of the IUS, S/C, Multi-use Mission Support Equipment (MMSE) and CITE elements in the Vertical Processing Facility (VPF).

(4) Coordinate inputs to schedules for the flow and processing of the IUS and S/C in the RSS & Orbiter.

(5) Ensure the preparation of the Integrated Operations and Maintenance Instructions (OMI's), DOP's and TP's by the appropriate contractor is adequate and timely:

a) For all STS off-line activities.

b) For IUS & S/C stand alone STS on-line activities.

NOTE: Shuttle integrated OMI's are the responsibility of the Shuttle Operations Directorate.

(6) Chair pre and post test briefings for major events in the IUS-S/C processing flow (off-line).

(7) Provide a primary point of contact for the spacecraft owner/operator who will:

(a) Ensure that agreed to S/C inputs are covered in the documentation. Evaluate inputs for engineering sufficiency. Monitor BAC-N, MDTSCO and RI to make certain that approved S/C requirements are provided for.

(b) Provide technical advice to the spacecraft contractor on all engineering data required at KSC.

Boeing Aerospace Company (BAC-N) and McDonnell Douglas Technical Services Company (MDTSCO) are on contract to support CO.

2.1.3. SHUTTLE OPERATIONS (VO). The Director, Shuttle Operations is responsible for management and technical direction of STS preflight, launch and landing activities for KSC. This includes on-line integration of cargo and orbiter and all on-line pre-integration activities. VO will:

a. Lead the test team for on-line operation.
b. Participate in Ground Operations Working Groups.
c. Develop and approve integrated schedules for on-line processing (SLF, OPF, VAB, Pad-A).
d. Provide site management for on-line facilities, ie. SLF, OPF, VAB MLP, Pad-A.
e. Hold and chair pre-test briefings for major on-line operations.
f. Prepare on-line integrated OMI's.
g. Ensure that cargo on-line support requirements are satisfied.

2.2 USAF 6555th AEROSPACE TEST GROUP

The 6555th ASTG, acting for DOD/Space Division (USAF), is the IUS launch agent for all DOD and NASA launches. The IUS launch agent has primary responsibility for the IUS system, its operational control, and its status reporting during all operations. Boeing Aerospace Company (BAC) Full Scale Development (FSD) contract supports the 6555th ASTG. The 6555th ASTG's responsibilities include:

a. Deliver assembled and checked out IUS to the VPF per agreed upon schedules.

b. Control IUS test, checkout and data evaluation.

c. Provide IUS stand alone DOP's.

d. Make IUS OMI inputs to KSC integration contractors, (BAC/N, MDTSCO, and RI).

e. Review and concur in OMI's involving the IUS.

f. Provide the IUS portion for the IUS-S/C mate and interface verification operations.

g. Provide IUS test director/test controller for all IUS operations.

h. Co-chair the IUS Ground Operations Working Group with CP-DPO.

i. Participate as a member of the IUS-S/C Ground Operations Working Group.

j. Designate in 6555 ASTG/LV a manager responsible for the IUS operations.

k. Participate as a member of the cargo test team, chaired by CS-MVD.

2.3 BOEING AEROSPACE COMPANY - FSD CONTRACT (BAC/A)

Under the FSD contract, BAC has the responsibility to design, develop, assemble and test the IUS. The assembly work is done in the Solid Motor Assembly Building (SMAB) at Cape Canaveral Air Force Station (CCAFS). Testing is controlled via a Checkout Station (COS), located in the Vertical Integration Building (VIB), CCAFS.

Landlines and appropriate terminations extend this test control for all IUS operations to the VPF, RSS and Pad 39A. The contractor's responsibilities include:

a. Provide Hands on Hardware support for IUS processing in KSC facilities.

b. Provide IUS unique GSE.

c. Support IUS Aft Flight Deck (AFD) panel/console installation and removal in and from the VPF and orbiter.

d. Refurbish IUS Airborne Support Equipment (ASE).

e. Provide test team support for IUS-S/C processing.

f. Prepare and submit OMI inputs to 6555th ASTG.

g. Develop DOPS.

h. Provide technical support to the IUS working groups.

2.4 SPACECRAFT OWNER/OPERATOR

The spacecraft owner/operator is responsible for providing the spacecraft on schedule, identifying support required at KSC for a successful launch and providing a launch team to process the spacecraft and participate in integration activities.

The owner operator will:

a. Designate a manager as a point of contact for all matters relating to S/C activities at KSC.

b. Ensure that the S/C designer/developer designates a manager for each company involved in KSC processing.

c. Identify and negotiate all KSC support requirements with CP-DPO.

d. Review and concur in IUS-S/C OMI's and the Launch Site Support Plan (LSSP).

e. Participate as a member of the IUS-S/C Ground Operations Working Group.

f. Ensure a S/C launch processing plan is prepared.

g. Participate as a member of the cargo test team, chaired by CS-MVD.

2.5 SPACECRAFT DESIGNER/DEVELOPER

The spacecraft designer/developer is responsible for processing and quality assurance of the spacecraft prior to integrated testing and support of all integrated tests. The designer/developer is responsible to the spacecraft owner/operator for the development of required procedures, requirements and other documentation. he designer/developer will provide unique spacecraft GSE to checkout and prepare the spacecraft for launch.

The spacecraft designer/developer will:

a. Support all integrated tests.

b. Develop spacecraft test requirements.

c. Develop TP's and input, as required, to OMI's.

d. Provide spacecraft unique GSE.

e. Provide a spacecraft launch team.

f. Provide a launch processing plan.

g. Input, review and concur in the LSSP.

2.6 BOEING AEROSPACE COMPANY - NASA CONTRACT NAS10-9206 (BAC/N)

The NASA IUS/spacecraft integration contractor operations at KSC are performed at KSC by BAC/N. Planned activities are performed by the contractor for NASA/KSC on a mission basis through integration, checkout, prelaunch and launch operations for the IUS and spacecraft. IUS-S/C integration contractor's responsibilities include:

a. Support KSC in operations planning, including integration and ground operations planning, processing flows and timelines, and IUS-spacecraft Launch Site Support Plans.

b. Provide test documentation including preparation of and inputs to integrated OMI's, S/C Program Requirements Document (PRD) (Annex G L&L 20000), and Operations Requirements (OR) documents. Integrate IUS and spacecraft inputs, as required for inputs to the shuttle integrated OMI's.

c. Test activities including test conduct, schedules, system engineering support, quality assurance and safety and preparing inputs to cargo and shuttle schedules.

2.7 MCDONNELL DOUGLAS TECHNICAL SERVICES COMPANY (MDTSCO) NASA CONTRACT NAS10-9600

MDTSCO is the Interim Cargo Integration Operations contractor (ICIO) at KSC. In this capacity MDTSCO is responsible for planning, control and performance of activities which verify that the IUS-S/C to CITE (Orbiter simulator) interfaces operate within planned specifications. Additionally, MDTSCO is responsible for the operation and scheduling of the Multi-Mission Support Equipment (MMSE) canister.

MDTSCO responsibilities include:

a. Process IUS-S/C through integration and interface verification activities. Support IUS & S/C in the conduct of stand alone activities.

b. Transport IUS-S/C from the VPF to LC-39 in the MMSE canister/transporter.

c. Support RI during shuttle/IUS-S/C processing in the OPF and RSS.

d. Operations & Maintenance (O&M) responsibility for MMSE canister, CITE, facility systems, RSS/payload systems.

e. Develop, maintain and display integrated STS off-line schedules including

   (1) VPF 72 Hr/11 Day Schedule.

   (2) Input to STS/Cargo 72 Hr/11 Day Schedule.

   (3) Cargo Integrated Operations Schedule.

   (4) Input to VO STS-N Integration Schedule Assessment.

f. Develop and maintain test documentation, including Integrated Operation and Maintenance Instructions (OMI).

g. Test activities, including test conduct, schedules, system engineering support, quality assurance and safety and preparing inputs to cargo shuttle schedules.

2.8 ROCKWELL INTERNATIONAL (RI)

Rockwell International (RI) is the orbiter contractor and is responsible to VO for the planning, control and performance of activities in the OPF, RSS, and orbiter payload bay. The Contractor's cargo responsibilities include:

a. Installation of the IUS-S/C in the Payload Ground Handling Mechanism (PGHM) and payload bay.

b. Support on-line processing of the IUS-S/C payload.

c. O&M responsibility for PGHM, RSS and orbiter.

d. Develop and maintain integrated on-line schedules including:

   (1) Pad 72 Hr/11 Day Schedule.

   (2) STS/Cargo 72 Hr/11 Day Schedule.

e. Perform installation of IUS Aft flight deck equipment into the orbiter.

f. Develop and maintain integrated OMI's.

2.9 INTERFACE WORKING GROUPS

To accomplish the integration of IUS and S/C and preflight processing through KSC facilities, interface working groups have been established. Definition and control of IUS to KSC interfaces is established through the activities of the IUS Ground Operations Working Group, co-chaired by 6555th ASTG and NASA KSC, CP-DPO. Management planning of IUS-S/C integration testing is accomplished by the IUS-S/C Ground Operations Working Group (GOWG), chaired by NASA KSC, CP-DPO. Definition and control of S/C to KSC interfaces is established through the activities of this working group.

2.9.1 RESPONSIBILITIES. The responsibilities of the above working groups are as follows:

a. IUS-S/C Ground Operations Working Group:

(1) Develop a sound working relationship between government agencies and test team organizations to ensure a timely exchange of technical data.

(2) Ensure that appropriate technical/management personnel from each agency participate in this working group's meetings.

(3) Maintain close coordination with all government agencies, BAC, spacecraft owner/operator and spacecraft designer/developer in the areas of test requirements, and test planning.

(4) Maintain cognizance of all IUS and S/C developments that could affect IUS-S/C prelaunch processing at KSC.

(5) Assess IUS-S/C development to assure compatibility with shuttle operations, facilities and support equipment.

(6) Define the engineering requirements for integration of IUS-S/C with the Orbiter.

(7) Identify technical problems related to KSC facilities and IUS-S/C processing, and assign action items to the appropriate agency for problem resolution.

The meeting calendar for this working group is decided by a consensus of participating agencies and the exigencies of the program.

b. IUS Ground Operation Working Group (IUS GOWG).

The GOWG is the major forum for IUS/KSC interface coordination. Interagency launch activities that include the IUS system are established through the workings of this group. Primary responsibilities of the GOWG include:

(1) Post DD-250 ground operations planning for the STS/IUS.

(2) Ensuring that appropriate technical/management personnel from each agency participate in the definition, design, and modification of facilities and support equipment that is used to support IUS launch operations.

(3) Reviewing agreements, requirements, and design of facilities and equipment to ensure their compatibility with the IUS system.

(4) Ensuring that interface control documentation between the IUS system and launch site resources is prepared and controlled in a timely fashion to minimize programmatic risks.

(5) Providing the focal point for developing generic IUS operations for shuttle/IUS launches at KSC.

(6) Identifying interagency issues requiring higher management level attention and proposing solutions to such issues.

The IUS/KSC Operations Management Plan, contains a complete description of the IUS GOWG responsibilities.

The meeting calendar for this group is determined by CP-DPO and 6555th ASTG.

2.9.2 INTERFACE WORKING GROUP MEMBERS. The interface working group members serve as the principal point of contact to bring the necessary project and operational elements together for coordination of IUS-S/C requirements that are consistent with launch site capabilities. The governmental and contractor agencies which are the principal members of the IUS-S/C processing and launch team are:

KSC Major Directorates, ie. CP, CO, VO, TS, SF, SP, DE.

Johnson Space Center

NASA Spacecraft Lead Center

6555th Aerospace Test Group, USAF

Boeing Aerospace Company

Spacecraft Owner/Operator

Spacecraft Designer/Developer

McDonnell Douglas Technical Services Company

Rockwell International

KSC integrates the operation of these organizations to support IUS-S/C processing and launch, and to perform the management and integration of all activities. Personnel from these agencies meet, as required, to ensure program milestones are met, technical interface problems are solved and serve as focal points for their respective program activity.

SECTION III

3.0 CARGO TEST TEAM STRUCTURE

It should be recognized that while there are government-S/C owner management lines of responsibility for the flight hardware, the primary line of authority for test and operations is through the formal test team structure.

The test team structure varies dependent upon the type and locale of test. The Cargo Test Team has been established as the primary line of authority for STS off-line operations and will be used as a unit to support the STS shuttle test team for shuttle on-line operations. It is presently planned to perform:

IUS stand alone testing (IUS non-integrated) VPF, RSS, OPF.

S/C stand alone testing (S/C non-integrated) VPF, RSS.

Payload integration (IUS-S/C interface) VPF.

Cargo integration (IUS-S/C CITE) VPF.

Cargo integration (IUS-S/C orbiter) orbiter payload bay.

Cargo integration (transportation & handling).

To plan and perform these tests, the test team is structured from the following agencies:

KSC Major Directorates CP, CO, VO, SF, TS and SP.

Spacecraft Lead Center.

6555th ASTG.

BAC(A) and BAC(N).

Spacecraft Owner/Operator.

Spacecraft Designer/Developer.

MDTSCO.

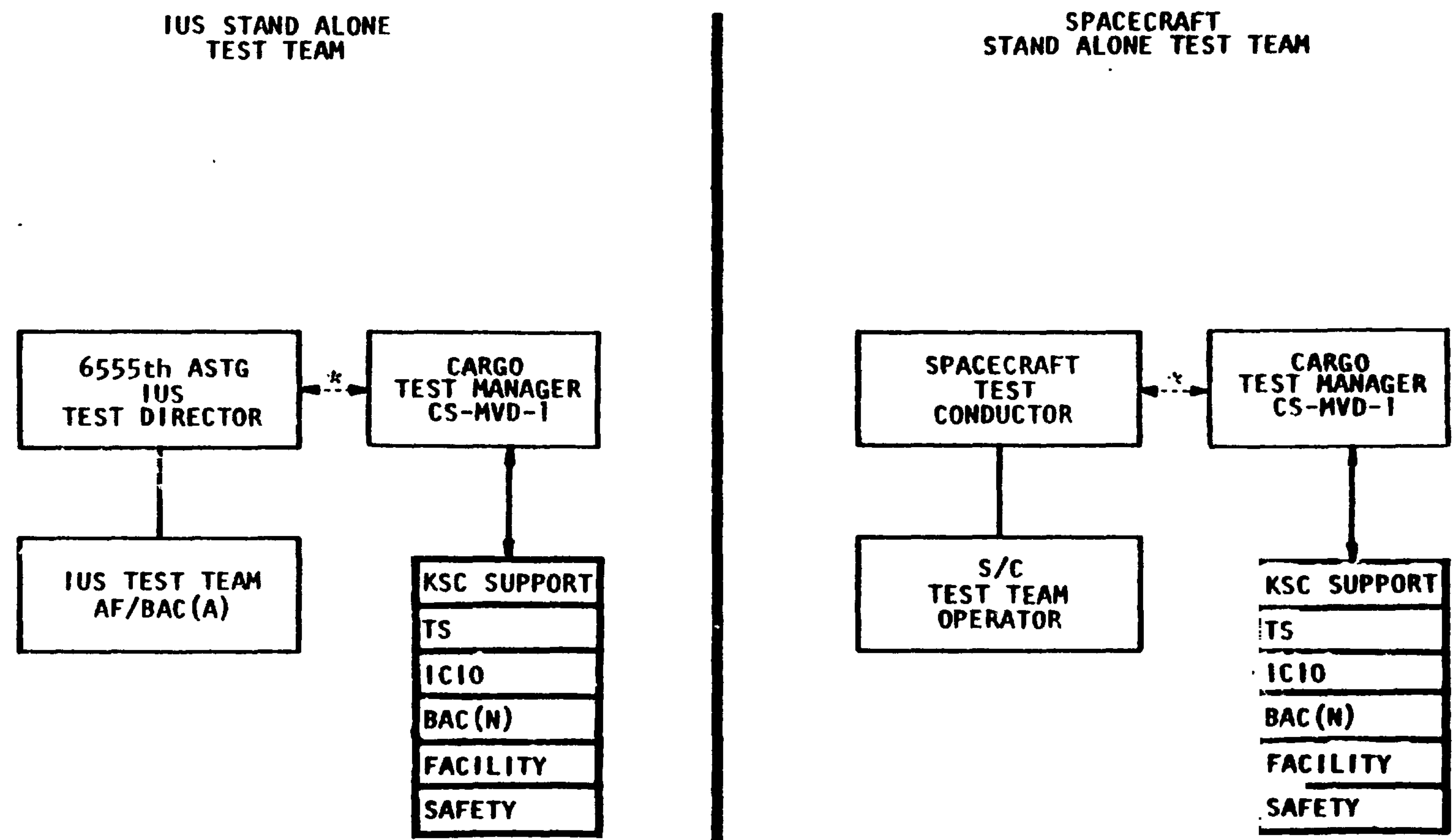
RI.

Technical evaluation and operational control responsibilities for both the IUS and S/C will be retained in their entirety by the 6555th ASTG/BAC/(A) and the S/C owner respectively, from receipt at KSC through launch. However, these operational control responsibilities are under the overall supervision of the appropriate NASA test manager/director (off-line and on-line) relative to safety, protection of the shuttle, associated facilities, GSE and personnel. Figures 3-1, 3-2, 3-3 and 3-4 show the test team structure by which IUS-S/C processing will be performed. They reflect test team authority and functional responsibility but do not show organizational responsibility or contractual authority. Similar responsibilities will exist for subsequent missions and will be modified by experience.

Line functions and specific responsibilities of test team members such as test control, engineering, quality control and safety are described in the appropriate section of this document. Each organization will provide the required support to facilitate IUS-S/C processing.

3.1 STS (ON-LINE) TEST TEAM STRUCTURE

The STS on-line test team is shown in Figure 3-5. It reflects the test team authority and functional responsibilities during on-line IUS-S/C processing.



* KSC TEST MANAGER PROVIDES FACILITY CONTROL, SCHEDULING AND TEST SUPPORT.

ELEMENT TEST DIRECTOR/CONDUCTOR IS RESPONSIBLE FOR CONDUCTING HIS STAND ALONE TEST.

Figure 3-1. Organizations for IUS & S/C Stand Alone Operations

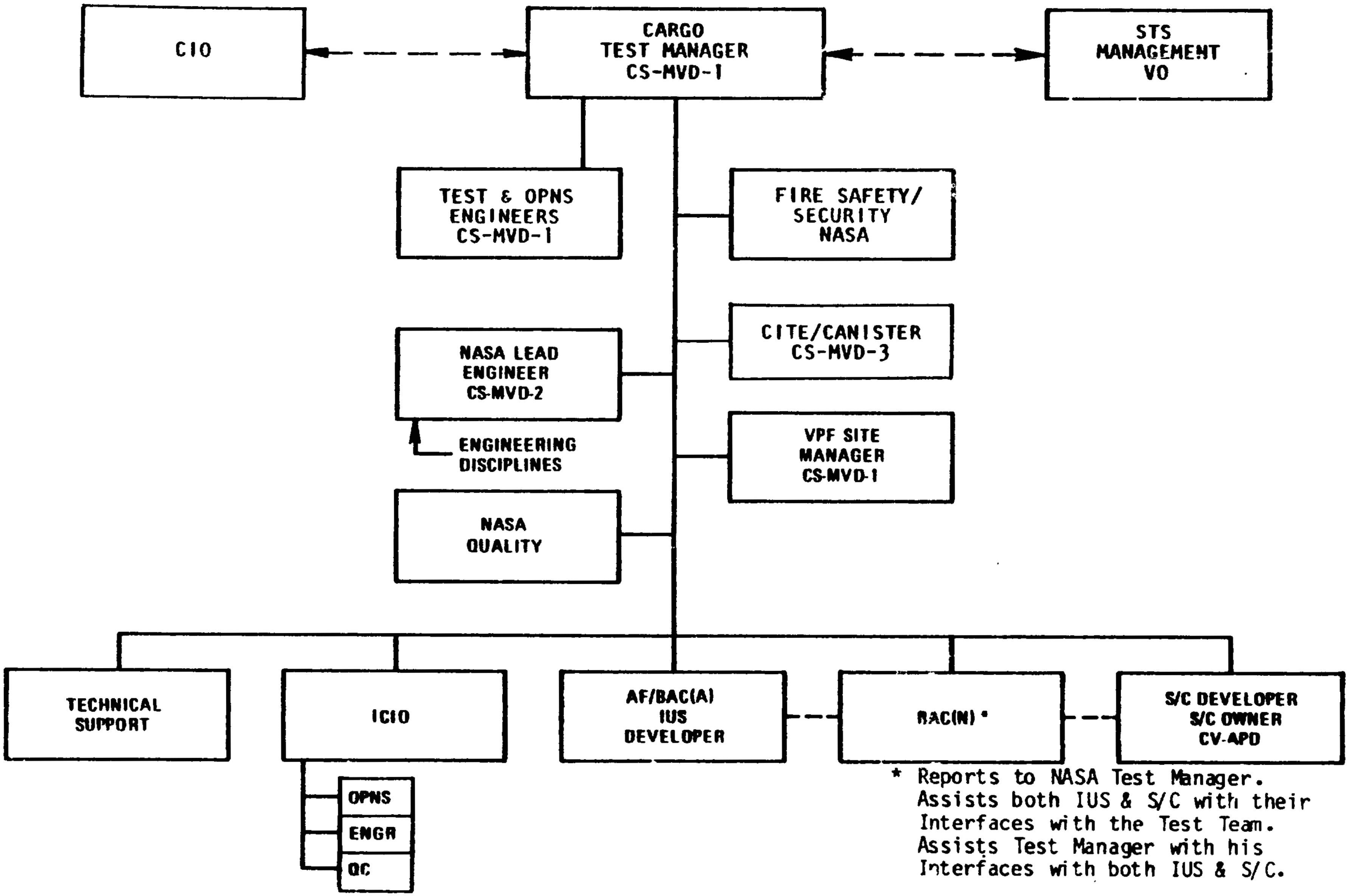


Figure 3-2. Organization for Day-to-Day IUS-S/C Operations

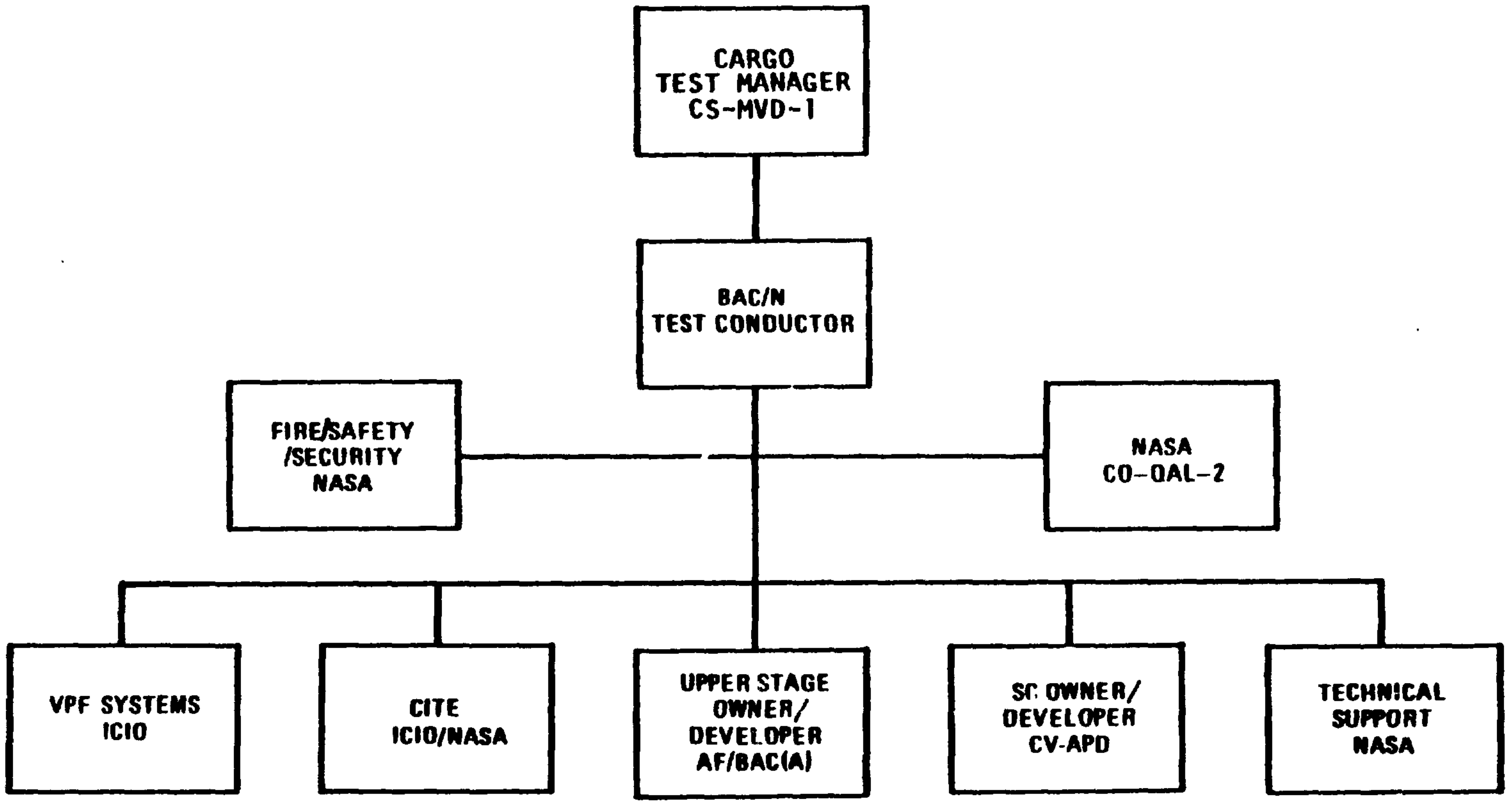
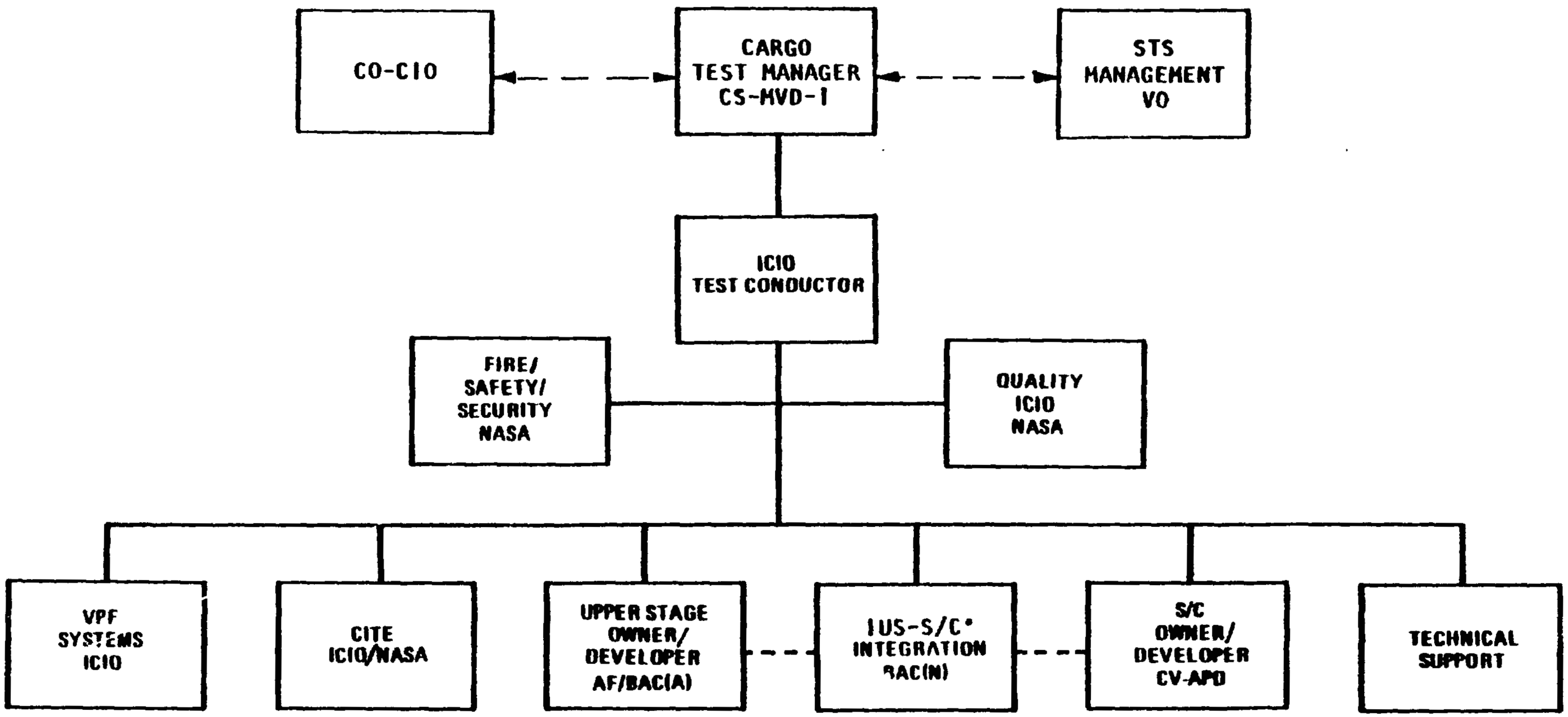


Figure 3-3. Test Conduct Organization for Integration of IUS-S/C



* REPORTS TO NASA TEST MGR
ASSISTS BOTH IUS & S/C WITH THEIR INTERFACES WITH THE TEST TEAM
ASSISTS TEST MGR WITH HIS INTERFACES WITH BOTH IUS & S/C

** N/A TO MIXED CARGOES (VERTICAL AND HORIZONTAL)

Figure 3-4. Test Conduct Organization for CITE & Subsequent Off-Line Integrated Operations**

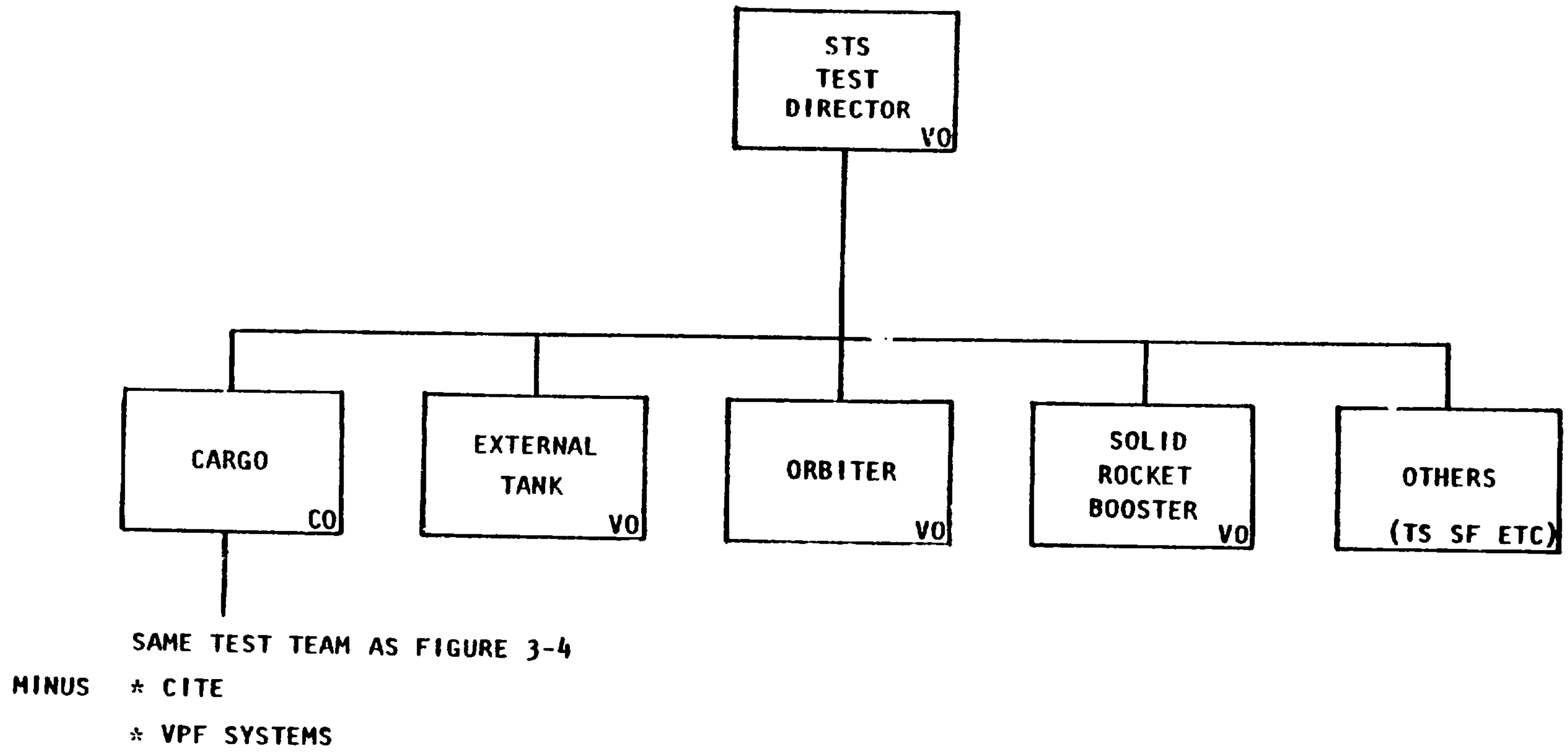


Figure 3-5. Organization for Shuttle on Line Operations

SECTION IV

4.0 TEST OPERATIONS

The Multi Mission Support Division, CS-MVD, directs and controls the operational day to day management of IUS-S/C flight hardware processing activity throughout the period the hardware is at KSC. A Test Manager, designated by CS-MVD, will be responsible for the in-test interface and coordination between the test team and the outside operational elements. Processing activity in on-line facilities by the CS-MVD/Contractor test team will be under the direction of the VO Test Director.

A test team will follow the IUS-S/C during test operations from receipt in the VPF through launch. The IUS test director and test controller, designated by the 6555th ASTG, are responsible for management of the Air Force and BAC/A test team in their support of IUS operations at KSC.

BAC/N, spacecraft contractor, MDTSCO (ICIO) and BAC/A (through the 6555th ASTG) test conductors are responsible to the test manager in their respective areas of operations. During IUS-S/C integration tests, the BAC/N test conductor directs IUS-S/C test activities. The MDTSCO test conductor directs activities associated with all other VPF operations, MMSE and Cargo Integration. The test conductors' responsibilities are shown on Figures 3-1, 3-2, 3-3, 3-4 and 3-5 for the different types of tests. Test operations involving the IUS, S/C and IUS-S/C combination in NASA facilities are categorized as follows:

IUS stand alone testing (IUS non-integrated) VPF, RSS, OPF

S/C stand alone testing (S/C non-integrated) VPF, RSS

Payload integration (IUS-S/C interface) VPF

Cargo integration (IUS-S/C CITE) VPF

Cargo integration (IUS-S/C orbiter) orbiter payload bay

Cargo integration (transportation & handling)

The overall view of the IUS and S/C test events from hardware arrival at KSC through launch is shown on a typical IUS-S/C integrated flow and timeline, Figure 7-1. Tests and operations involving a single element with minor support from others may be performed as a stand alone test but if more than one element is involved, an overall integrated procedure (OMI) will be required.

IUS or spacecraft tests accomplished as stand alone functions are the responsibility of the 6555th ASTG and spacecraft owner/operator respectively. Inputs are made to the 72 hour, 11 day schedule, maintained by ICIO (MDTSCO), to provide visibility of projected activities and to obtain any necessary support for off-line activities.

No test will be conducted without:

(1) previously prepared, reviewed and properly approved procedures, and

(2) the activity being shown on the KSC approved 72 hour/11 day schedule.

4.1 VOICE COMMUNICATIONS

Since IUS, S/C, and CITE control rooms are remote from the flight hardware under test, voice communication capability between operational locations is mandatory. The Operational Intercommunication System (OIS) is the system used at KSC. Compatible, interconnecting links (TOPS) are utilized to tie in the operational personnel at KSC with the IUS COS in the VIB at CCAFS and the spacecraft control center at CCAFS, and other major test locations like MCC-H and/or SCF.

4.2 IUS

Technical adequacy of IUS tests conducted in NASA facilities at KSC will be under the cognizance of CS-MVD and is the responsibility of the USAF 6555th Aerospace Test Group (ASTG). The 6555th ASTG will participate in the test teams shown in Section 3.

4.3 SPACECRAFT

Technical adequacy of spacecraft tests, conducted in NASA facilities at KSC, is the responsibility of spacecraft owner/operators and spacecraft designer/developers.

These organizations will be under the cognizance of CS-MVD and will participate in the test teams shown in Section 3.

4.4 IUS-S/C INTEGRATED TESTS

All integrated IUS-S/C tests are controlled by the KSC test manager using the OMI's developed by the test team. He is supported by integration test conductors (BAC(N), MDTSCO or RI) and NASA engineers and the 6555th ASTG in the coordination and conduct of the operation. The tasks of the test manager include advising agencies of readiness reviews, test schedule coordination, ensuring that test constraints have been properly identified and evaluated, and that all anomalies have been resolved or properly dispositioned by the organizations involved and accepted by NASA management.

4.4.1 ORDNANCE OPERATIONS. All ordnance related activities involving either the IUS or spacecraft will be contained in an OMI, prepared by MDTSCO, except when the IUS-S/C is the only payload element in the cargo, in which case a BAC DOP will be used. The procedure will be developed in sections and will cover ordnance operations in the VPF, RSS and payload bay. The document will be organized in such a manner that individual tasks such as "stray voltage checks" can be scheduled and worked sequentially on the cargo elements being processed.

4.5 TRANSPORTATION AND HANDLING

Movement of the IUS-S/C from the VPF to the RSS is the responsibility of ICIO, who has Canister O&M responsibility. This operation is controlled by an approved OMI and conducted by the test manager. The move schedule and pre-move briefings are coordinated by the test manager and the ICIO test conductor.

4.6 PRE-TEST/OPERATION BRIEFINGS

Pre-test/operation briefings are held prior to the start of a specified test/operation to:

a. Disseminate information regarding the test/operation.

b. Provide instructions regarding the test/operation.

c. Obtain certifications that all aspects of the test/operation are ready.

Pre-test/operation briefings are held at the discretion of the VO test director, responsible test manager for flight hardware operations or site manager for ground support equipment operations, but as a minimum include all major integrated OMI's, including subtask DOP's and TP's.

4.7 OPEN ITEM REVIEWS

An integrated Open Item Review (OIR) is held for all integrated OMI's. The review is held prior to the pre-test/operations briefings, and is scheduled and chaired by the responsible NASA test manager/director via the IUS-S/C 72 hour/11 day operations schedule (off-line), and the KSC STS 72 hour/11 day schedule (on-line). Participating team members will identify any open paper or hardware problems that could impact the scheduled operations.

4.8 UNPLANNED EVENTS

These are defined as any nonconformance, failure, or unsatisfactory condition which has the potential to adversely affect safety, contribute to schedule impact or launch delay or result in a design change. All problems encountered during IUS and spacecraft stand alone tests and IUS-S/C interface integrated tests are reported to the applicable test conductor over the OIS/TOPS. He will supervise troubleshooting. Problems will be documented during IUS and spacecraft stand alone tests as follows:

a. IUS problems and discrepancies will be documented as specified in Boeing Document D290-50000-1, "ELS/IUS Operations Record System", dated March 19, 1980.

b. Spacecraft problems and discrepancies will be documented as specified in the applicable spacecraft owner/operators Quality Assurance (QA) plan.

Starting at IUS-S/C mechanical mate, interface problems and discrepancies are documented per the KSC Problem Reporting & Corrective Action (PRACA) system. When a problem occurs during integrated testing, or when it could seriously impact another organization supporting the operation, it shall be reported verbally to the appropriate test conductors as soon as the problem becomes known.

4.8.1 PROBLEM REPORTING AND CORRECTIVE ACTION (PRACA) SYSTEM. PRACA is a method for identifying, reporting, analyzing, remedying and preventing recurrence of hardware and software problems. A complete description of this system is contained in KMI 5310.11B, dated August 13, 1976. The implementation of the systems for IUS-S/C integration will be defined in POP Q-501, "Problem Reporting and Corrective Action System (PRACA)".

IUS-S/C integration interface problems and discrepancies are documented as an Interim Problem Report (IPR) using a Problem Report (PR) Form 2-151. When a problem is reported, an IPR will be generated and an immediate investigation will be made by the KSC integration contractor to determine test team member responsibility. Isolation of the problem may result in the IPR being upgraded to a PR and annotated that the problem resolution has been assigned to the appropriate test team member. If the problem is flight hardware or contractor GSE oriented, the test team member then reverts to his own problem reporting paper system to record, troubleshoot and close out the problem. When the problem has been closed out, a copy of the test team member disposition is attached to the PR for permanent record and PRACA closeout. Problem reporting and resolution for government furnished and facility systems are the responsibility of MDTSCO in the VPF and RI in the RSS. For on-line testing, IPR's will be called in to a central control. Central Control will identify an IPR number and log the IPR into a central tracking data base.

SECTION V

5.0 DOCUMENTATION

The Government provides many types of facilities, equipment and support services to using agencies at the AF CCAFS and the NASA Kennedy Space Center. Existing support at the AF CCAFS is documented in SAMTEC Det #1 Capabilities Handbook and SAMTEC Det #1-TR-76-04, Range Instrumentation Handbook. Support available at KSC is documented in KMI 8660.2B, Test Support Documentation and KHB 8610.1B, Support Services Handbook.

5.1 SUPPORT REQUIREMENTS DOCUMENTATION

All spacecraft contractor facility and support requirements to be imposed on the site are accumulated in the Launch Site Support Plan (LSSP). This document is prepared for NASA by BAC/N and has been released as Annex 8 to the Payload Integration Plan (PIP) JSC-14019. The intent of the LSSP is to define the manner in which the agency could/would satisfy the requirement of the contractor. Support not normally planned by KSC but required by the spacecraft contractor is designated 'Optional Services'. After the "Optional Services Portions" have been negotiated, a S/C PRD is prepared for internal KSC use. Generic requirements relative to the IUS system were input into an IUS Program Introduction Document early in the program by the USAF (SAMSO/LVR, changed to SD/YV) to allow a preliminary statement of capability to be made by the host agency Eastern Space Missile Center (ESMC), or KSC. The IUS PRD was developed by BAC/A and approved by the Air Force. The definition of the support required from NASA was provided to KSC as an IUS PRD for incorporation into the KSC Launch and Landing PRD 20,000 by KSC. In response to both PRD's, Program Support Plans (PSP's) are developed, showing how IUS-S/C requirements are satisfied. S/C PSP responses will be included in a later revision to the LSSP.

Call up of those requirements from the PRD, applicable to specific tests, including interface verification activities, are provided by NASA in a UDS formatted Operations Requirements (OR) document. OR's are required three months before test. Test Support responds to the OR with an Operation Directive (OD) to reflect provisioning of the specific test support. Support requirements for each OMI will be identified in the appropriate section of the OMI. IUS and spacecraft personnel will be required to review the OMI, to make certain that support required to run the test is included in the OMI.

5.2 OPERATIONS DOCUMENTATION

IUS-S/C processing at KSC uses Operations and Maintenance Documentation (OMD). BAC Detailed Operating Procedures (DOP) and S/C Test Procedures (TP), where appropriate, may be used for subtask and non-integrated tests. A brief description of these procedures follows.

5.2.1 OMD. The OMD is required to perform ground operations activities for processing IUS-S/C payloads through the STS systems including its support equipment and the launch and landing facilities. Included in this system are the:

OMRS Operations and Maintenance Requirements & Specifications

OMI O&M Instructions

OMISS OMI Summary Sheets

5.2.2 CARGO OMD CONTROL. The preparation of OMI's is described in OMI Handbook KHB 8610.4A. As applied to IUS-S/C processing, KSC will be responsible for identifying a focal point, to be known as the "Cargo OMD Control Board", for the management and coordination of OMD development and continuing maintenance.

The KSC integration contractor (BAC/N) is a member of this board and will provide the necessary interface between the bo? and spacecraft organizations. The 6555th ASTG/ST Division (SP-AF) is also an OMD Control Board member and will provide the interface to the IUS contractor.

5.2.3 OMRS. The OMRS document is the sole means of providing to KSC the technical requirements and specifications (both flight vehicle and ground systems) that are required to verify the IUS to S/C interface and the IUS-S/C cargo interface to CITE and to the orbiter. IUS-S/C technical processing requirements in the VPF, OPF, RSS and orbiter payload bay are governed by OMRS. These integrated OMRS will be prepared by JSC and inputted into the CDS OMRS system, in accordance with OMRS File I, JSC 08171.

5.2.4 OMI. All organizations involved in IUS-S/C processing will be involved in the development of integrated OMI's. This involvement will entail providing detailed instructions (not OMRS) pertaining to the S/C or IUS operations, review of and comments to drafts of the integrated OMI, and participation in OMI review meetings. Development of integrated OMI's is the responsibility of KSC. OMI's provide for operational coordination, test management, console or test equipment operation, monitoring or readout, and any related instructions required to verify performance, to maintain or to service flight and ground systems. It is the responsibility of the IUS-S/C test team members to ensure that OMI's involving IUS or S/C hardware, prepared by BAC/N, MDTSCO or RI comply with and fulfill the IUS and S/C OMRS and other necessary instructions.

5.2.4.1 <u>OMISS</u>. OMI Summary Sheets are prepared by the orbiter integration contractor for use with OMI's conducted in on-line facilities. The IUS-S/C integration contractor (BAC/N) will input to these OMISS', as required to support On-Line processing.

5.2.5 SAFETY REQUIREMENTS. All Operations and Maintenance Instructions, developed for use at the Kennedy Space Center (KSC), must meet KSC safety requirements. As the OMI's are developed, the KSC integration contractor, responsible for the OMI, will assign a safety category based on the criteria in KMI 1710.13B and coordination with applicable systems engineers. Final determination of the hazardous/nonhazardous category is the responsibility of the Safety Operations Office/SF-SOO-1. Hazardous OMI's and OMI revisions, which increase hazard level, are submitted for approval to the KSC Safety Office, (SF-SOO) prior to final release. Non hazardous OMI's and OMI revisions are distributed with a copy to SF-SOO-1.

5.2.6 EMERGENCY PROCEDURES. It is the responsibility of each test team organization, involved in IUS-S/C processing, to identify in the appropriate OMI, DOP or TP the tasks to be performed to place the IUS and/or spacecraft in a safe condition. All OMI's containing hazardous operations must have adequate emergency provisions for each hazardous operation. Each sequence of a hazardous operation is analyzed to determine what effect the sequence may have if an emergency condition should arise. The emergency procedures must contain specific actions necessary to cope with the emergency condition and will address those hazards unique to the operation and provide rapid shutdown and safing of equipment for the protection of personnel and equipment. The emergency procedure shall be available at all times during the operation and must be in one of the

following locations:

a. As Appendix Z in the back of the manual OMI with upper right corner of the pages cut to distinguish from the remainder of the OMI.

b. As an Emergency Procedures Document (EPD), provided it is identified in the operating procedure as a prerequisite to the test and is readily available to operational personnel.

5.2.7 PROPOSED OMI'S. The following list of proposed OMI's represents those necessary for IUS-S/C processing and is mission unique. It is annotated to show which integration contractor has been recommended to write and publish each OMI.

OMI PROCEDURE	RESPONSIBLE CONTRACTOR
IUS Receival and Installation in VPHD	MDTSCO
IUS S/C Mate/Demate	BAC/N
T-0 Umbilical Integration, Room 104	MDTSCO
IUS AFD Panels Installation - VPF	MDTSCO
IUS AFD Panels Checkout - VPF	MDTSCO
IUS - Spacecraft Electrical Mate	BAC/N
Preconnection Checks & Connect IUS to SMCH	MDTSCO
IUS-Spacecraft Integration Test	BAC/N
Cargo Interface Verification Test	MDTSCO
Cargo Mission Simulation Test	MDTSCO
Ordnance Stray Voltage Checks	MDTSCO
Remove IUS AFD Panels and Transport to OPF	MDTSCO
IUS-Spacecraft Preps for Move	BAC/N
Cargo Closeout & Preps for Move	MDTSCO
Canister/Transporter Entry into VPF	MDTSCO
Install & Transport IUS-Spacecraft in MMSE	MDTSCO

IUS AFD Installation & Checkout - OPF	RI
Install IUS-Spacecraft in PGHM	RI
Return Canister Transporter to Storage Area	TS
Ordnance Activities in RSS	MDTSCO
IUS-Spacecraft Preps for installation in Payload Bay	BAC/N
Install IUS-Spacecraft in P/L Bay & Mate	RI
Preconnection Checks & Electrical Mate	MDTSCO
Cargo Interface Verification Test	MDTSCO
End to End Test	MDTSCO
Ordnance Stray Voltage Checks & Connection	RI
Orbiter Launch Closeout	RI
IUS-Spacecraft Launch Closeout	BAC/N
Launch Countdown	RI

5.2.8 OMI RELEASE. Approved OMI's are required to be available 30 days prior to the test. Late OMI revisions and approved reissues are distributed to be in the hands of the operations processing team no later then 48 hours prior to the start of operations.

5.2.9 OMI REVIEWS. OMI reviews are scheduled and conducted by the responsible integration contractors to assure satisfaction of user requirements, and using organizations's acceptance of reviewed OMI. All in-process reviews are scheduled sufficiently in advance to permit external participants (i.e., Air Force, JSC, GSFC, other project offices and contractors) the opportunity to participate as they deem necessary.

Using organizations will:

a. Be an integral part of the review team and will participate in the development of O&M requirements and the approval of subsequent documentation.

b. Assure that the format, presentation, style, and technical level of the writing is commensurate with skill levels and training of personnel who will participate in the integrated operations under review. Designate a focal point for OMI activity coordination.

A full description of the Operations and Maintenance Documentation Plan is contained in K-STSM-12.8 dated 1 June 1978.

5.2.10 DOCUMENT CHANGES. OMRS files may be changed only by approved Requirements Change Notices (RCN's). Changes to OMI's may be effected by Instruction Change Requests, Deviations and Partial Revisions. KHB 8610.4A contains instructions with regard to the methods to be used in processing changes.

5.3 DOCUMENT APPROVAL

The approval level of OMI's is established by OMD Control Board policy and KSC POP's. There are no OMP's or OMISS' in Cargo Operations. The OMP and OMISS for the shuttle resides with VO.

5.3.1 OMI SIGNATURES. OMI's developed/generated by Cargo Operations and Cargo Operation's contractors will contain one contractor and one NASA approving signature on the OMI approval page. The NASA approving signature will be the lead systems engineer or the appropriate project engineering office when integrated activities are involved. An exception to this policy will be allowed in cases

when KSC/CO elements such as the project engineering function and the CITE and Canister Branch have dual responsibility for the development of an integrated OMI. For hazardous OMI's, the KSC Safety Office will also be required to sign the approval page after the contractor and NASA signatures have been secured. The backup signature sheet will contain one signature of authority from each of the involved organizations. For OMI changes (partial revision) by ICR (up to 15 days prior to use) the ICR backup sheet will contain one signature from each affected organization. If the approval page is changed, the new page will be signed as it was for the basic. For OMI changes by Deviation, the Deviation form will contain the approval signatures. For OMI revisions (total reissuance of OMI) the signature requirements are the same as they were for the basic OMI.

5.3.2 OMI SUBTASKS. When a task can be separated from the serial test sequence, it may be advantageous to develop separate procedures for that task. Start and completion of the task should be tied into the control sequence of the OMI. These separate procedures become part of the OMI and are subject to review by CO, VO and SF (as required). In those cases where a previously developed IUS Detailed Operating Procedure (DOP) or S/C Test Procedure (TP) exists that will accomplish the task, that procedure may be used. No procedure (DOP or TP) should be referenced, however, if the intent is to use only portions of the previously developed procedure. In those cases, the necessary sequences must be included in the OMI itself.

5.4 DETAILED OPERATING PROCEDURE/TEST PROCEDURE

Procedures in standard contractor format may be used to conduct stand alone tests. A stand alone test is a test that:

a. Does not require support from another cargo/payload element, the orbiter, CITE or Launch Processing System (LPS).

b. Requires limited support from other contractors.

c. Can call up "standard" support, i.e., OIS, escort, transportation, range clearance and support external of KSC. Such support must be substantiated by existing policies for support i.e., OR, and/or the 72 hour/11 day schedule.

The procedure must identify the support required, which must be coordinated by the requester.

5.4.1 DETAILED OPERATING PROCEDURE (DOP). The DOPS prepared by BAC/A to support IUS-S/C processing in the VPF, RSS and OPF are approved by BAC management and the 6555th ASTG USAF. NASA, VO/CO, participates in DOP review cycles for:

a. Awareness of task being performed;

b. Assessment of facility compatibility and NASA support tasks;

c. Adequate work control;

d. Verification that procedure is acceptable for stand-alone or OMI subtask.

A back-up sheet with CO/VO signatures is appended to each procedure after recommended changes have been coordinated with the 6555th ASTG and incorporated. The USAF signature signifies both technical and ESMC Safety approval. These procedures are transmitted by the 6555th ASTG to KSC through the KSC Program Office, CP-DPO. KSC safety approval on all hazardous procedures is required prior to

release. The KSC Safety approval is given to the 6555th ASTG in letter format via the ESMC Safety office. Any changes recommended by KSC Safety will be submitted to ESMC Safety office, who will transmit them to the 6555th ASTG. DOP's are required to be submitted to NASA for review 60 days prior to need date.

5.4.2 TEST PROCEDURE (TP). The TP's prepared by the S/C contractor to support IUS-S/C processing in the VPF, RSS and P/L bay are approved by S/C contractor management and NASA-S/C Lead Center. These procedures are provided to the LSSM by S/C Lead Center. The LSSM will be responsible for TP distribution within KSC for review/concurrence. He will ensure that KSC Safety approves all hazardous TP's prior to release. Any recommended changes will be submitted to the LSSM who will discuss them with NASA Lead Test Center and the S/C contractor. Concurrence signatures will be appended after all changes have been approved. All test procedures are submitted to NASA for review 60 days prior to use.

5.5 IUS/SC COMMAND AND DATA LIST

The primary objective of the command and data list is to identify the IUS-S/C commands and telemetry that require command generation or telemetry processing either by the orbiter or JSC Mission Control Center - Houston (MCC-H). The command and data list will contain command and data requirements that must be verified as a part of IUS-S/C to orbiter interface verification at KSC. IUS command and telemetry data, provided in Boeing Document D290-10351-1, "IUS/TDRS Command and Telemetry List", has been taken from the IUS controlling documents, i.e. 290-50013 for telemetry and S290-51001 Vol. XI for command. The S/C telemetry and command information in D290-10351-1 was obtained from S/C contractor documentation. D290-10351-1 is an annex to the PIP and is prepared by BAC/A, approved by SD, and forwarded to JSC.

5.6 LAUNCH COMMIT CRITERIA

The STS and Cargo Launch Commit Criteria Handbook, K-STSM-12.8.2 establishes and implements the KSC launch commit criteria during launch countdown and applicable prelaunch tests.

CP-DPO will be responsible for:

a. Development and coordination of all IUS and related payloads redline inputs for incorporation into LCCD Section 1,3 and 4.

b. Coordination with elements of the test team to assure the technical adequacy of the IUS/payload redline inputs.

c. Coordination with responsible IUS design agencies (MSFC & Air Force Space Division) to assure design compatibility with launch commit criteria.

SECTION VI

6.0 SOFTWARE

IUS unique and flight mission programs are the responsibility of BAC(A) and JSC. During integration testing of the IUS-S/C payload however, there exists a capability to display/monitor the IUS or S/C data in the Operations & Control (O&C) or Launch Control Center (LCC) control rooms. This display capability will be limited to those measurements defined in the IUS-S/C Orbiter Master Measurements List. No block mode data display capability exists.

6.1 CITE MONITORING CAPABILITIES

The monitoring capabilities available through the LPS operating system software are outlined below. These capabilities are provided for monitoring of a payload at either the pad or CITE.

6.1.1 OPERATING SYSTEM SOFTWARE. The real-time measurement and display monitor, using inherent system capabilities, allows a test engineer to simultaneously monitor and display payload measurements. One capability called Display Monitor (DMON) is limited to monitoring and display of measurements. A second capability, called Exception Monitor (EMON), in addition to providing a monitoring capability, also provides notification to the operator whenever a measurement exceeds pre-defined limits. The Display Monitor (DMON) provides the capability to select and display the value of measurements in near real-time. DMON will support monitoring of analog, discrete, floating point digital pattern, and multiword digital pattern measurements. DMON allows a test engineer to request up to three CRT display pages with a maximum of 30 measurements per page.

Measurements to be monitored may be selected with manual input by the test operator. Values are obtained from a payload by a Front End Processor (FEP), which in turn transfers the updated data to the Common Data Buffer (CDBFR). Measurements in the CDBFR are accessed by the Console subsystem and DMON pages are updated every nine seconds. Once activated, measurements are monitored continuously until operator action is taken to deactivate the measurement.

The Exception Monitor (EMON) capability controls the CRT display of predefined measurements that have exceeded established limits. Exception detection is performed by the FEP subsystem processing the measurement data. The FEP in turn updates the CDBFR and notifies the console subsystem responsible for the measurement that an exception has occurred. The test engineer is then provided with notification of the exception through the EMON CRT display page. EMON provides three CRT display pages at each console position, with a maximum of 15 measurements per page. The EMON display will show exception information for analog, discrete, digital pattern, and multi-word digital pattern types. For active analog exceptions the CDBFR is read periodically, the three latest samples are maintained with the exception message. Individual analog exception messages are updated once every nine seconds.

6.1.2 DATA RECORDING. An area related to data display is the capability to record data. LPS is constructed such that all measurements that are sampled and displayed can also be recorded. After the data is processed by the FEP it is transferred to the CDBFR. These data are then transferred to the Processed Data Recorder (PDR) area for recording on magnetic tape and disk. The Shared Peripheral Area (SPA) of LPS can be used to retrieve and display these data for post-test analysis.

SECTION VII

7.0 SCHEDULING

To produce functional flow & timelines and schedules, similar to a typical flow currently in work for IUS-S/C, (see Figure 7-1), technical requirements are received from the IUS and spacecraft contractors as well as other participating agencies (IUS-S/C, ICIO, OI). These requirements are coordinated with NASA and meshed into a logical and efficient sequence of events to become the basis for functional flow timelines and schedules, covering the IUS/Spacecraft. These flows, after approval by CS-MVD, are displayed in a KSC provided display area, (staffed by MDTSCO personnel) and disseminated to all participating agencies. A detailed functional flow timeline and schedule is being developed and displayed for each vehicle being processed. These flows and timelines show each major task to be accomplished and are the basis for the inputs to the ICIO maintained 11 day/72 hour schedule. The schedule details the tasks to be accomplished in hours for the first 72 hours and shifts for the following 11-day period, and specifies all technical support planned and facility outages required to support IUS-S/C processing. Figures 7-2, and 7-3 show the KSC scheduling system. Each activity or event is identified by OMI, test procedure or DOP number and a record of actual versus planned processing times and sequences is maintained. Significant scheduled tasks that require STS support or affect STS operations will be input to the STS/payload 72 hr-11 day schedule, maintained in Firing Room 4, which controls all STS activities. (See Figure 7-4). The planned timeline for each activity during vehicle processing is monitored and compared to actual test times by the IUS-S/C test team to determine if a timeline change is warranted. These assessments will be submitted to NASA with recommendations for subsequent flows.

7.1 TEST SUPPORT

Key items of support that were requested in the LSSP/PRD are committed when required by the KSC 72 hour/11 day schedule. Changes to this schedule which involve test activities and/or support items are made by the cargo test manager.

7.2 REAL TIME SUPPORT SCHEDULING

Realtime changes to vehicle processing requires the cargo test manager's approval. Realtime changes (within 24 hours of schedule start time) to support a planned activity or for emergency support requirements are made through the cargo test manager by telephone or OIS during test.

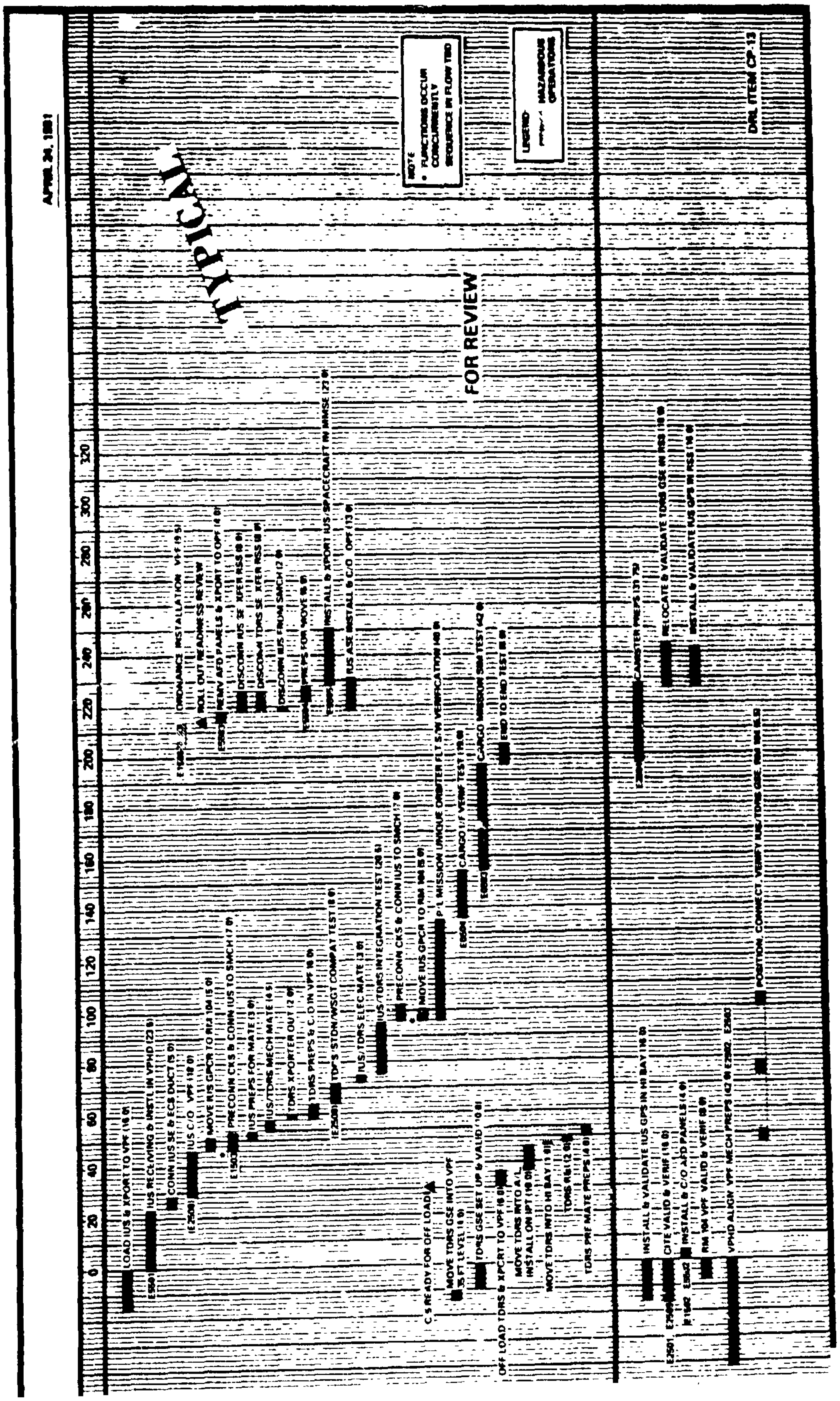


Figure 7-1. IUS/TDRS-A Integrated Processing. Sheet 1 of 2

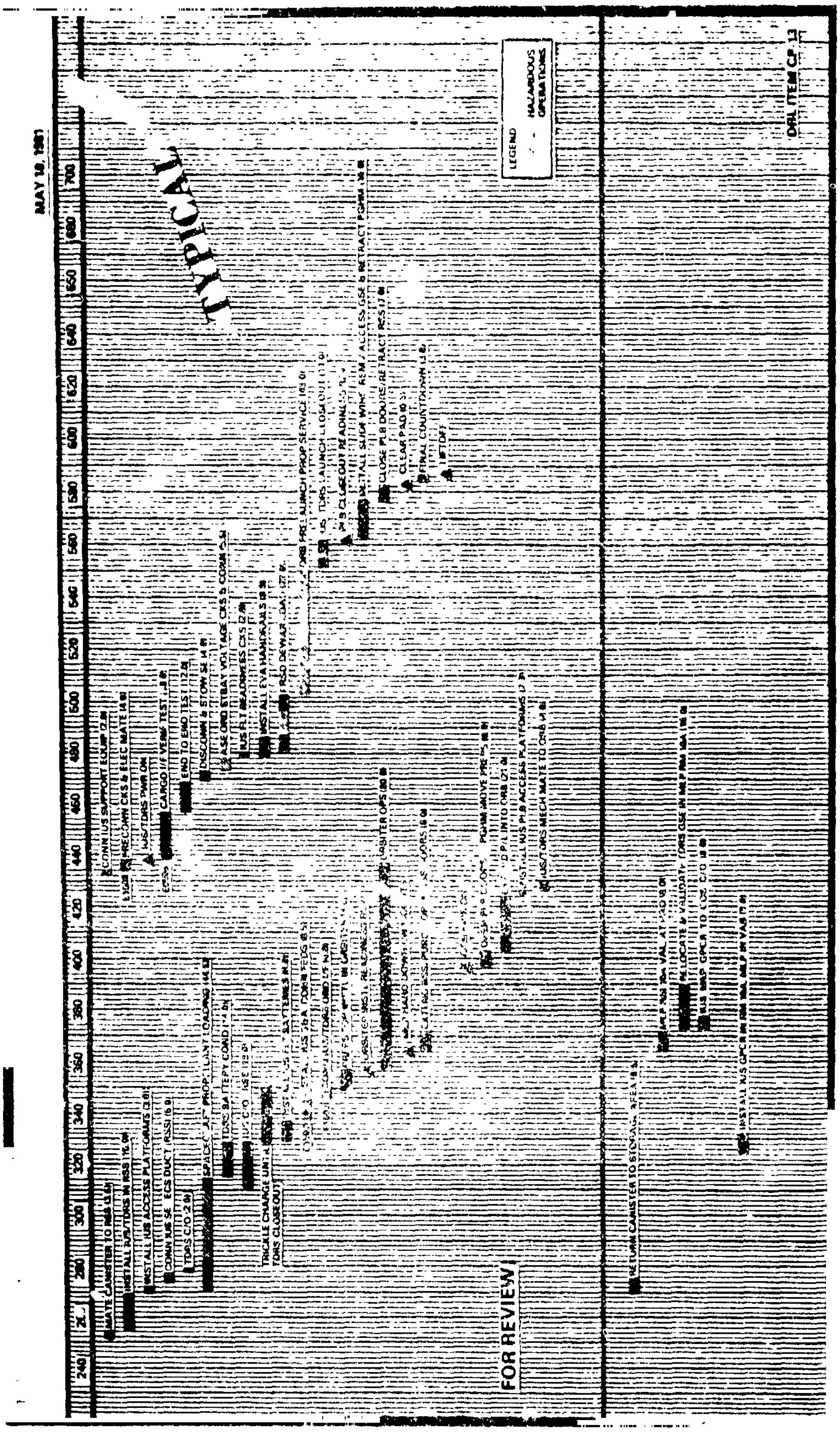


Figure 7-1. IUS/TDRS-A Integrated Processing. Sheet 2 of 2

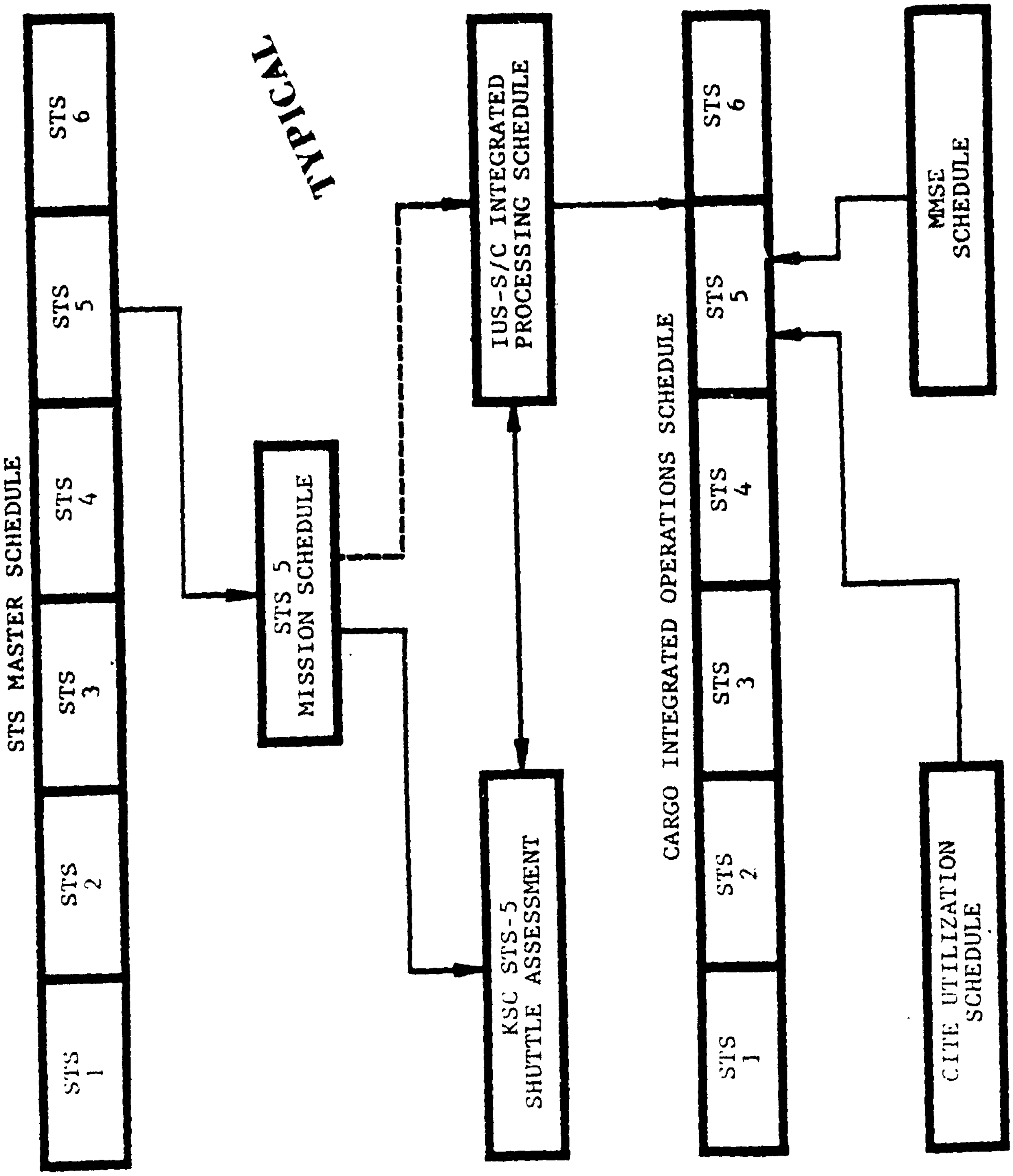


Figure 7-2. Cargo Operations Scheduling System

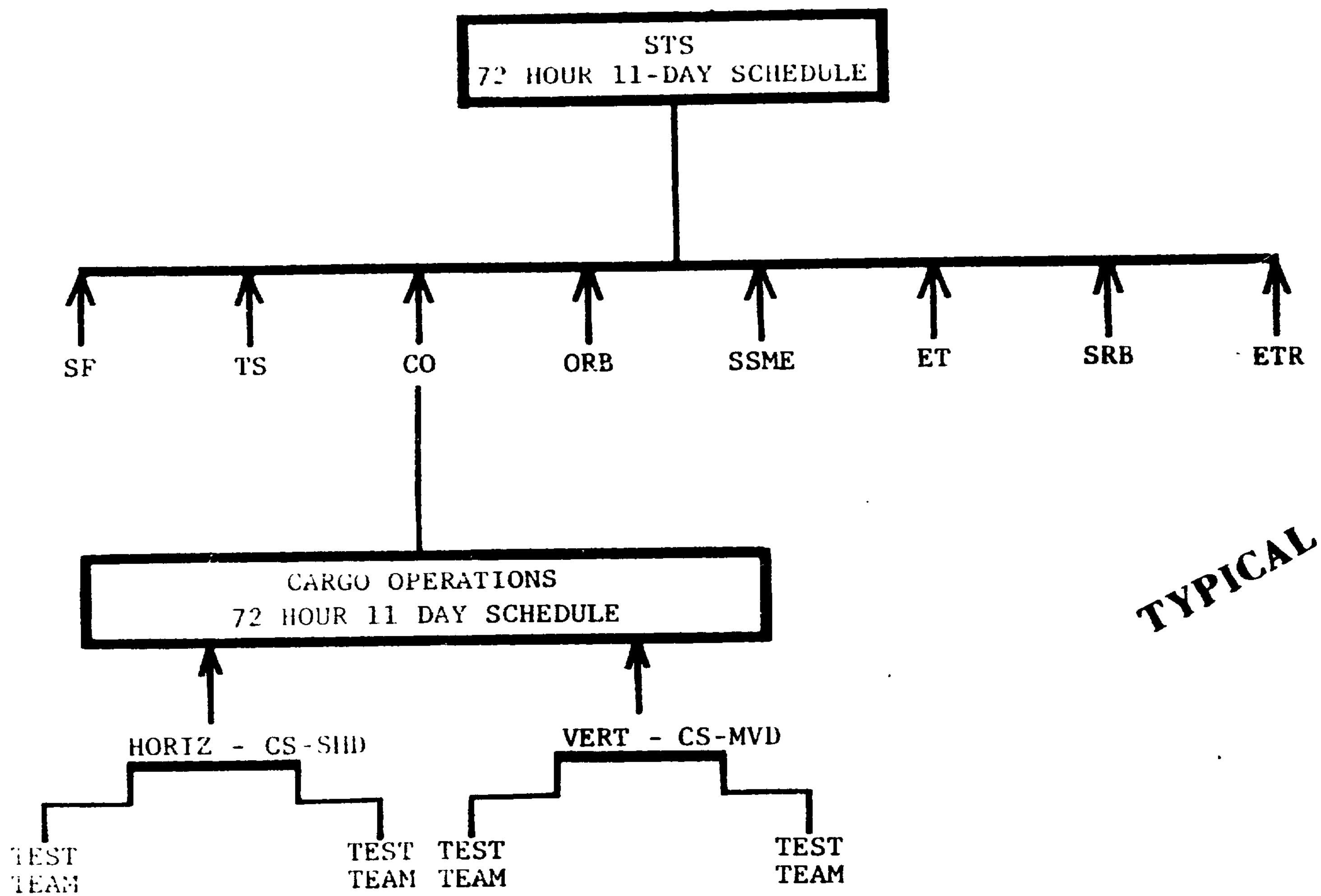


Figure 7-3. Cargo Operations 72 Hour-11 Day Scheduling System

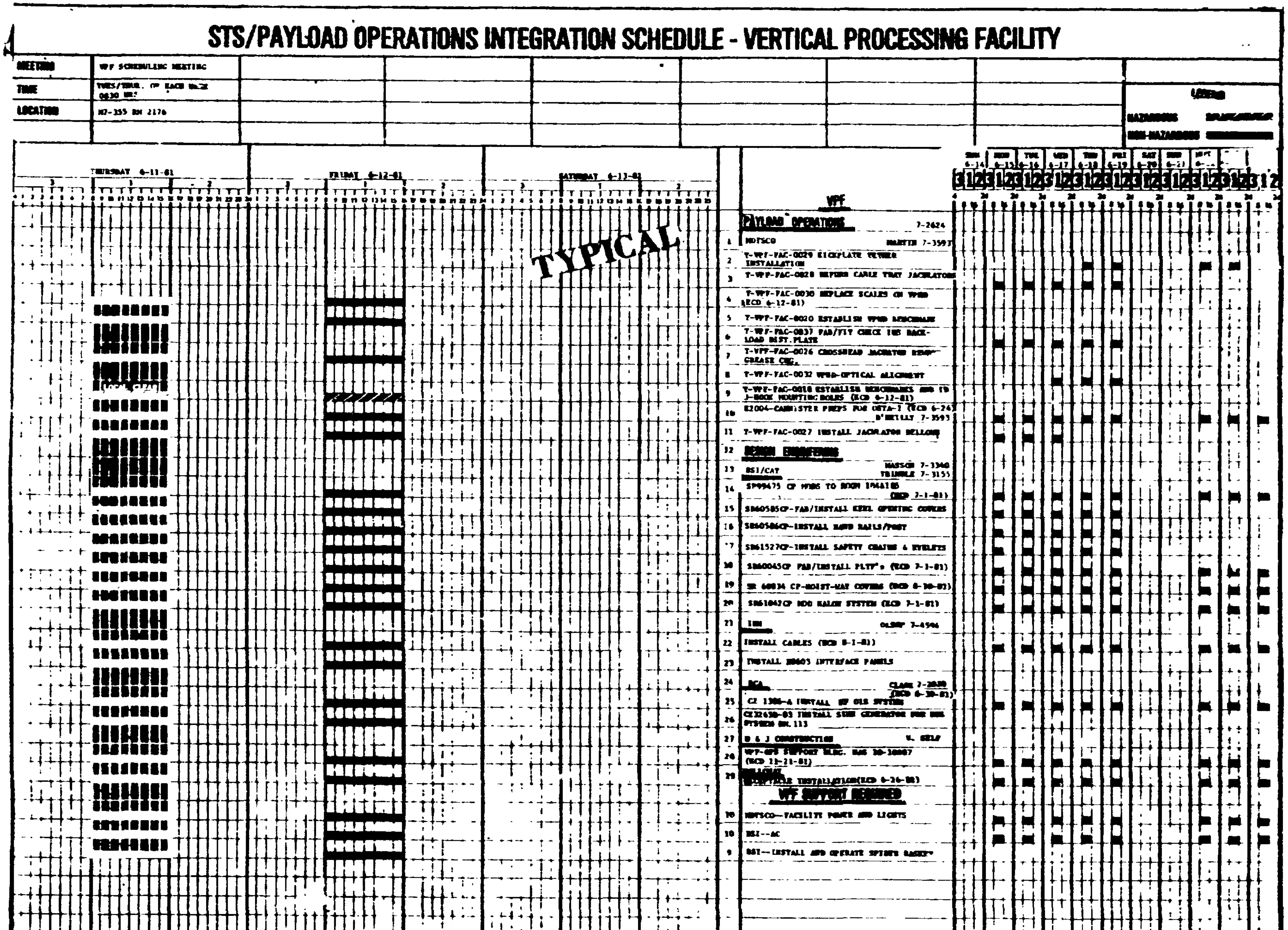

STS/PAYLOAD OPERATIONS INTEGRATION SCHEDULE - VERTICAL PROCESSING FACILITY
MEETING
TIME
LOCATION
LEGEND
HAZARDOUS
NON-HAZARDOUS
THURSDAY 6-11-81
FRIDAY 6-12-81
SATURDAY 6-13-81
TYPICAL
VPF
PAYLOAD OPERATIONS 7-2624
T-VPF-FAC-0030
T-VPF-FAC-0020
T-VPF-FAC-0032
T-VPF-FAC-0027
BSI/CAT
INSTALL CABLES
WPF SUPPORT BLDG.

Figure 7-4

SECTION VIII

8.0 WORK CONTROL

The KSC STS work control system encompasses the functions of work planning, work scheduling, work resources planning and scheduling, work authorization, production control, work status reporting, work performance evaluation, and integration and control. These functions are applicable to organizational level hands-on-hardware work which is performed on flight hardware and related GSE/facilities in direct support of STS ground processing.

8.1 WORK AUTHORIZATION DOCUMENT

During IUS-S/C integrated processing at KSC it is presently planned to use three Work Authorization Documents. These are:

a. Approved and signed OMI's, DOP's and TP's - see section 5.0.

b. Approved Test Preparation Sheets (TPS). These are used to document and authorize work in KSC facilities, ground support equipment, and flight items when the work has not been previously authorized by OMI or non-conformance document.

c. Problem Reporting & Corrective Action (PRACA)- see section 4.8.

8.2 TEST CLOSEOUT

Following the completion of the test and with the approval of the test manager, the test conductor directs the dispositioning of test hardware and documentation. The test set up is disassembled and property is dispositioned. Test documentation shall be stored in accordance with program requirements.

8.2.1 DATA REVIEW. (To Be Determined)

8.2.2 TEST REPORT. A Test Completion Sheet (TCS, KSC Form 4-264) is prepared by the KSC integration test conductor responsible for conducting each OMI. For overall integrated tests, each participating CO contractor prepares a TCS form and provides a copy to the test manager within 5 work days after the operation is completed. The test manager requires the appropriate TC to prepare an "as-run" bar chart to supplement the TCS form, and includes:

a. Time required to perform each subtask.

b. Time lost due to holds.

c. Other significant events as required to comprehensively depict the performance of the operations.

d. Test problems and their resolution.

The individual responsible for preparation of the TCS obtains the concurring signature of his CS-MVD counterpart. Instructions for completion of TCS form are contained in POP 0-503, "OMI Implementation".

SECTION IX

9.0 QUALITY ASSURANCE

Each test team organization associated with the IUS-S/C integration (Figures 3.1, 3.2, 3.3, 3.4) shall maintain an effective and timely quality assurance activity.

Each test team organization is responsible for recurrence control and quality assurance activities performed at KSC on their hardware during IUS-S/C non-integrated and integrated activities.

Test monitoring and closeout will be performed by the test team quality organization that has the responsibility for the .t. Other test team quality organizations will support as required.

9.1 INSPECTION & TEST PROCEDURES (OMI's)

Procedures shall be readily available to inspection and test personnel and physically located at the applicable location at the time of the inspection or test. No test is conducted without preplanned and properly approved procedures. Each integrated OMI will contain the following:

a) Nomenclature and identification of the test article or material.

b) Characteristics and design criteria to be inspected or tested, including values and tolerances for acceptance or rejection.

c) Detailed steps and operations to be taken in sequence, including verifications to be made before proceeding.

d) Layout and interconnection of test equipment and article.

e) Identification of hazardous situations or operations.

f) Precautions to comply with established safety requirements, ensure safety of personnel, and prevention of damage or degradation of articles and measuring equipment.

g) Environments and other conditions to be maintained.

h) Constraints on inspection or testing.

9.2 RECORDS

IUS and spacecraft data/documentation records are the responsibility of the respective test team organizations. The integration contractor shall maintain records and data of all tests and activities for which he has responsibility. The records and data generated shall be in sufficient detail to provide for complete verification and evaluation of operations, objectives and dates.

SECTION X

10.0 IUS-S/C SAFETY

KSC Safety Office will have overall responsibility for IUS-S/C safety integration operations, including off-line activities, at KSC. All personnel participating in the integration activities are responsible for performing those activities in a safe manner to preclude accident or injury, to utilize the appropriate personal protective equipment, and to immediately report any unsafe or hazardous condition to their immediate supervisor, IUS Safety, or the KSC Safety Office.

10.1 KSC SAFETY OFFICE

The KSC Safety Office will support the IUS-S/C integration activities to assure appropriate attention to safe operation and testing. Included will be the review/concurrence of all hazardous test procedures, handling procedures, the monitoring of hazardous test and critical hardware moves, and the assurance of compliance with KMI 1710.1C and Occupational Safety and Health Act (OSHA) requirements in integration activities (See OSHA General Industry Standards 29 CFR 1910) (see paragraph 5.2.5)

10.2 IUS-S/C INTEGRATION TEAM SAFETY

The IUS-S/C integration team is responsible for assuring all KSC safety requirements are met for operations they direct and perform. The integration team is responsible for adequately planning and performing operations with necessary regard for potential hazards to hardware and personnel. This includes assurance that personnel are properly certified to perform hazardous and critical functions, and that they have and use the proper protective equiment.

10.3 SAFETY IMPLEMENTATION

a. Safety Training and Certification. All supervisors will assure that personnel who are to perform hazardous or critical functions are trained and certified to perform those activities with maximum safety to conform with KHB 3410.1B "Implementing instructions for KSC Systems, Safety and Skills Training for certification of personnel".

b. Audits. Periodic audits of general safety practices will be made by Center safety monitors and coordinators from the KSC Safety Office and by all supervisors. All personnel, both KSC and the IUS-S/C contractor will support these audits as required.

c. Procedures. All IUS-S/C hazardous procedures will be reviewed and approved by KSC Safety.

d. Accidents. In case of accidental injury, personnel will go or be taken to the KSC health facility for immediate first-aid treatment. From there, they will be referred for other medical treatment as required. Serious personnel injuries or death and/or substantial damage to KSC resources, equipment, or facilities will be reported immediately to the Director, Safety, R&QA and Protective Services by the test manager and/or the appropriate integration contractor.

SECTION XI

11.0 CONFIGURATION MANAGEMENT

11.1 IUS

11.1.1 RESPONSIBILITIES. NASA/KSC is responsible for configuration management activities related to NASA/KSC facilities, systems, and equipment. Activities include configuration identification, control, accounting, and verification. NASA/KSC will participate through NASA/MSFC in review and assessment of IUS system changes including IUS support equipment (SE) modifications which are the design responsibility of DOD/SD. DOD/SD will participate through 6555th ASTG membership on the NASA/KSC Cargo Level III Configuration Control Board (CCB) in review, coordination, and assessment of changes to IUS ground processing facilities/equipment which are the design responsibility of NASA/KSC. KPD 8040.14 dated 5/9/77 'Plan for Upper Stage Configuration Management' establishes requirements and procedures and defines responsibilities for KSC upper stage configuration management.

11.1.2 CHANGE CONTROL. After baselining of the following documents,

a. IUS/KSC Operational Management Plan (OMP) IUS/KSC Facility and

b. Equipment Design Plan (FEDP) and interface control drawings,

c. Operations and Maintenance Requirements & Specifications (OMRSD),

any changes will be controlled as described in the following paragraphs:

11.1.2.1 Changes to the IUS/KSC OMP. This document will become a working agreement between NASA/KSC and SD/YVI and 6555th ASTG. Each party may submit a Document Change Notice (DCN) using the standard form. The OMP is not a contractual document; therefore, concurrence signatures will consititute final approval of all changes.

11.1.2.2 Changes to the FEDP and Interface Control Documents (ICD's). Changes to the FEDP will be submitted to KSC, using the NASA KSC Engineering Support Request (ESR). Associated costs are categorized as NASA-unique, DOD-unique, or common. DOD/SD will participate in the NASA/KSC change process in the KSC Cargo Level III Configuration Control Board (CCB) through 6555th ASTG CCB Membership. Changes to the baselined IUS to KSC ICD controlled interfaces will be submitted to KSC, using a Preliminary Interface Revision Notice (PIRN). All design agency (PIRN). All design agency/test team organizations impacted by the PIRN will submit evaluations, identifying the cost, schedule, and hardware/software impact of complying with the PIRN. The entire package will then be available for formal configuration management review and subsequent contractual implementation. After technical coordination and approval by the USAF Space Division, BAC/A & KSC, the Interface Review Notice (IRN) will be forwarded to the USAF SD CCB (via 6555th ASTG/ST) for SD approval and a commitment for funds (if required). The approved IRN's are then returned to KSC (via 6555th ASTG/ST) for submission to the KSC Level III CCB. The CCB approved IRN is submitted to the repository of the NASA/KSC custodian who assigns the IRN number, stamps the IRN master copy as "Repository Issue" and distributes it to all affected parties.

11.1.2.3 Changes to OMRS. Once the OMRS files have been baselined, the files may be changed only by approved RCN's in accordance with the change processing system described in JSC 08171, File I, utilizing the computer processing system as applicable. The change system, except for File XII, resides in the KSC CDS and takes the form of a change catalog with associated change files that will be created under it when the initial proposed change is entered.

11.2 SPACECRAFT

11.2.1 RESPONSIBILITIES. All spacecraft contractor facility and support requirements are accumulated in the LSSP. This document has been released as Annex 8 to the PIP JSC 14019. Spacecraft configuration management responsibilities are governed by each contractor's own documentation.

11.2.2 CHANGES TO THE LSSP. The development of the LSSP is an iterative process between the spacecraft owner and the Launch Site Support Manager (LSSM). Changes to the LSSP, i.e., requirements and the preliminary responses, are controlled through the Cargo Projects Level III Configuration Control Board (CCB). Requirements and the preliminary responses will be concurred in by all the participating organizations, i.e., spacecraft owner, customer, and KSC prior to either release of the baselined document or submittal of revisions to the CP Level III CCB.

11.3. KSC FACILITIES OPERATIONAL READINESS INSPECTION (ORI) AND CONFIGURATION INSPECTION (CI).

The ORI (a one time function, not a per-mission function) is to be performed at KSC on selected facilities, systems and support equipment, commencing no later than 30 days prior to Operational Readiness Date (ORD). The ORI is to comply with the requirement in STS Site Activation Management Plan K-STSM-10.5. A CI is a formal technical review and key program checkpoint to verify that the "as-built" hardware conforms to the "as-designed" baseline requirements. It also includes all approved changes and identifies and resolves any differences. The CI will support the ORD. A CI will be performed as defined in KSC Space Shuttle Configuration Reviews, KPD 8040.6, Attachment G and Procedure for DE, Configuration Inspections, DE-P-552, dated October 3, 1977.

SECTION XII

12.0 ADMINISTRATIVE SERVICES

12.1 TRAINING AND CERTIFICATION

The skill level, training and certification requirements for test personnel must be in consonance with KSC guidelines. All test team organizations associated with IUS-S/C processing at KSC are responsible for:

a. Providing training necessary to support their functions. (Exceptions to this general requirement are made in instances where the training requirement is common to other organizations and, in such cases, KSC will determine the training source).

b. Identifying and collaborating with the Systems Training and Employee Development Branch in enrolling its personnel in required training, conducted by other organizations.

c. Maintaining records necessary to reflect status of the training program.

12.1.1 TRAINING CERTIFICATION. All personnel (civil service and test team member) performing critical tasks or controlling critical processes or potentially hazardous operations in modifications, tests, checkout, maintenance, inspection, and operations are trained and certified by their employer. Certification of an individual's ability to perform a critical task can occur only after he has demonstrated that ability. All teams or crews engaged in independent team/crew operations, such as checkout and launch recovery, are certified as a unit after they have demonstrated their ability to perform the task effectively.

SECTION XII

12.1.2 RECERTIFICATION. Periodic retraining or demonstration of proficiency may be required of certified personnel to assure maintenance of the appropriate skill/knowledge level. The frequency at which this must occur is determined by the rate of skill/knowledge degradation, changes in specifications, equipment, and/or procedures that affect performance. Personnel, certified by their company, are given a card badge or similar evidence of certification to be carried on their person while performing their duties.

12.1.3 KSC AREA PERMIT AND SAFETY TRAINING REQUIREMENTS.

12.1.3.1 General. A KSC area permit is required for personnel access into the majority of STS operational sites/area/flight hardware within KSC. This is to ensure that personnel entry into various sites/areas and personnel access to flight hardware is authorized to only those specific personnel required. Specific safety training courses are required as a prequisite to an employee's being issued a KSC area permit (see Figure 12-1). This is to insure that each KSC area permit recipient has received proper safety training prior to entering a controlled area. In addition to the safety training courses, each employee is required to complete a "Familiarization Walkdown" for access and egress routes for specific site/area/flight hardware (see Figure 12-1).

12.1.3.2. KSC Area Permit. The KSC area permit has "Numbers" to identify the operational sites/areas and "Letters" to identify the flight hardware. A NASA/ government agency/test team member, requiring a KSC area permit, has his organi-

zation's KSC area permit Authorized Representative (CS-MVD) process a KSC Area Permit Application, Form 20-94. Personnel requiring specific "Familiarization Walkdown Training", schedule these requirements through their respective training organization. Personnel must complete the formal instructions of a required safety course prior to scheduling their familiarization walkdown and ensure that they have completed the appropriate training roster.

12.1.3.3 KSC Temporary Area Authorization (TAA). A KSC Temporary Area Authorization is to be issued to an individual who meets the essential personnel criteria requiring infrequent access or does not meet both security and training requirements, to be issued a permanent KSC area permit. A KSC Temporary Area Authorization will be issued by KSC Security for a minimum of one day or a maximum of thirty days, on an as required basis to NASA/government/contractor personnel. There are two types of KSC Temporary Area Authorizations:

a. Plain, which authorizes entry into STS operations controlled areas with no escort,

b. "To Be Escorted", which authorizes entry into STS operations controlled areas only when accompanied by a properly badged escort. The point of contact for personnel requiring these area authorizations is the LSSM.

12.1.4 TRANSPORTATION. Each test team organizaton will denote his transportation requirements in the applicable PRD and LSSP together with a request for motor vehicle operator certification. Government vehicles shall not be operated

by personnel without a valid KSC or CCAFS government license.

Regularly scheduled bus service for travel between areas at KSC should be used where possible.

12.1.4.1 Vehicle Control. Parking is permitted only in designated parking areas. Vehicle restriction data for each area will be provided by the cargo manager.

KSC STS OPERATIONAL AREA ACCESS SAFETY TRAINING COURSE REQUIREMENTS*

(FORMAL CLASSROOM COURSES) (AREA) / (PERMIT NO.)	Vehicle Assembly Building K6-848 1	High Bay 1 & 3 VAB 2	LC-39 Pads A & B 11	Fixed/Rotating Serv/Structure FSS/RSS 12	Payload Changeout Room 13	Mobile Launcher Platform MLP 14	Vertical Processing Facility VPF 18	Explosive Safe Area (ESA 60) 34	(FLIGHT HARDWARE)	Orbiter ORB A	Payloads P/L D
QG 101 KSC Fire Protection Safety Orient	●	●	●	●	●	●	●	●		●	●
QG 102 KSC Toxic Propellant Safety Orient	●	●	●	●	●	●	●	●		●	●
QG 106 KSC Toxic Propellant Refresher	●	●	●	●	●	●	●	●		●	●
QG 125 KSC LC 39 Facility Safety Fam	●	●									
QG 126 KSC LC 39 Pad Safety Fam			●	●	●						
QG 128 KSC KSC Industrial Area Safety Fam							●				
QG 150 KSC Flight Vehicle Safety					●					●	●
QW 25D --- VAB	●										
QW 25E --- VAB HB 1/3		●									
QW 26B --- Pads A & B			●								
QW 26B --- FSS/RSS/PCR				●	●						
QW 26C --- MLP						●					
QW 28C --- VPF							●				
QW 129 --- ESA 60 & Delta Spin Facility								●			

Figure 12-1. * Additional Training is required for personnel engaged in operations involving hypergols. Viz: QA501 KSC Scape Operator Certification. QA 570 Minor Hydrazine Spill and Clean up.